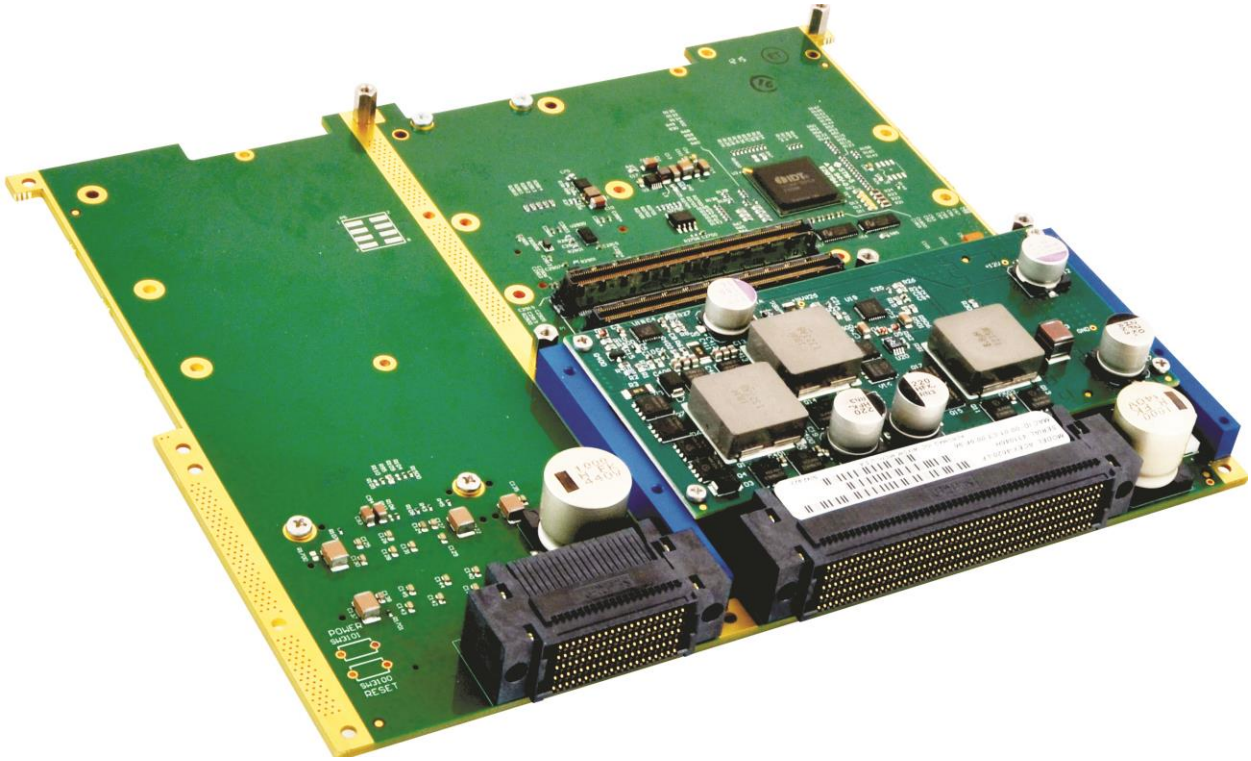
ACEX-4610/4620

COM Express Type 6 Carrier Board

USER'S MANUAL



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8501-005

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1.0 GENERAL INFORMATION

1.1 Intended Audience

This users' manual was written for technically qualified personnel who will be working with I/O devices using the XCOM-6400 COM Express module or any industry standard Type 6 COM Express module. It is not intended for a general, non-technical audience that is unfamiliar with computer-on-module (COM) devices and their application.

1.2 Preface

The information contained in this manual is subject to change without notice, and Acromag, Inc. (Acromag) does not guarantee its accuracy. Acromag makes no warranty of any kind with regard to this material, including, but not limited to, the implied warranties of merchantability and fitness for a particular purpose. Further, Acromag assumes no responsibility for any errors that may appear in this manual and makes no commitment to update, or keep current, the information contained in this manual. No part of this manual may be copied or reproduced in any form, without the prior written consent of Acromag,

1.2.1 Trademark, Trade Name and Copyright Information

1.2.2 Class A Product Warning

This is a Class A product. In a domestic environment this product may cause radio interference, in which case the user may find it necessary to take adequate corrective measures.

1.2.3 Environmental Protection Statement

This product has been manufactured to satisfy environmental protection requirements where possible. Many components used (structural parts, circuit boards, connectors, batteries, etc.) are capable of being recycled. Final disposition of this product after its service life must be conducted in

accordance with applicable country, state, or local laws or regulations.

1.3 Carrier Board Information – All Models (ACEX4610/20)

The ACEX-4610/ACEX-4620 models are Type 6 COM Express carrier boards. The ACEX-4610 model provides a COM Express interface with one PMC/XMC site, and the ACEX-4620 model provides a COM Express interface with two PMC/XMC sites. Interface to HDMI, VGA, Display Port, SATA, USB 2, USB 3, Ethernet, PCIe x4, GPIO, RS232, RS485 and Audio is provided via EDK and ACEX-FP boards also available from Acromag.

1.3.1 Ordering Information

The ACEX-46XX carriers ordering options are given in the following table.

Model Number	***Description***	***Temp Range***
ACEX-4620-LF[1-4]	*Type 6 Double-Wide PMC/XMC COM Express Carrier* ***Lead-free*** *Solder*	*-40*°C *to 85*°C[5,6]
ACEX-4610-LF[1-4]	*Type 6 Single-Wide PMC/XMC COM Express Carrier* ***Lead-free*** *Solder*	*-40*°C *to 85*°C[5,6]

Note 1: *Model listed includes all standoffs and screws required for an air cooled application.*

Note 2: *A conduction cooled application will require purchase of Carrier Accessory* ***ACEX-CC-01*** *(Conduction Cool Kit).*

Note 3: *An air cooled application with an Acromag XCOM-6400 will require purchase of the Active Heatsink* ***XHSA-6400****.*

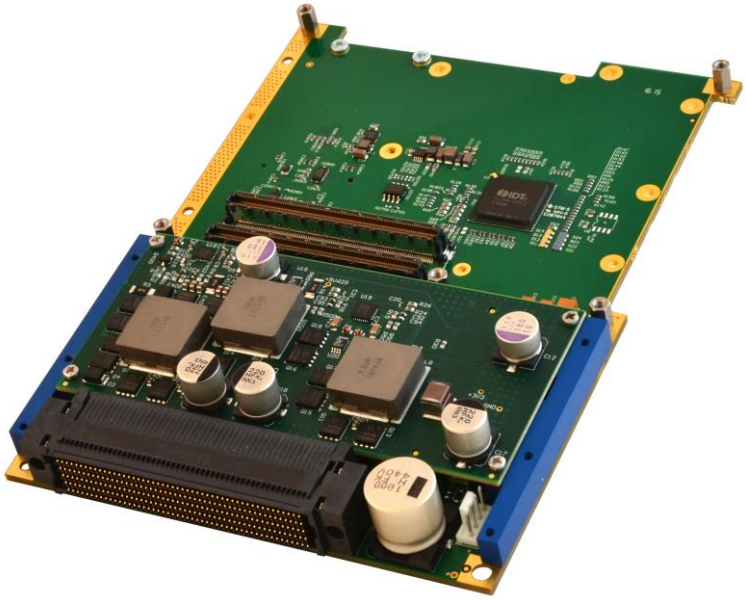
Note 4: *Air cooled applications may also require the Acromag Engineering Development Kit* ***ACEX-4600_EDK-LF*** *(Lead free). The platform to mount the carrier and EDK is available as Engineering Lab Development Platform* ***ACEX-4600-DLS****.*

Note 5: *Air cooled applications have a compromise temperature range of 0°C to 70°C.*

Note 6: *Audio Codec has a compromise temperature range of 0°C to 70°C.*

ACEX-4620-LF Model

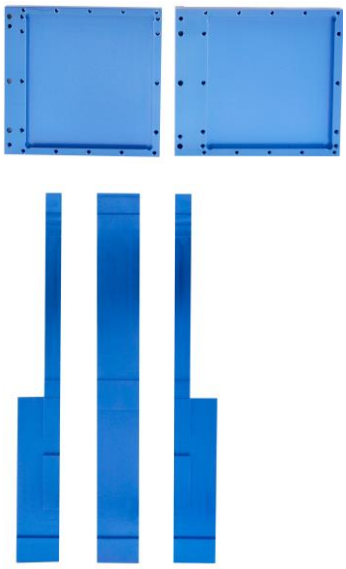
ACEX-4610-LF Model



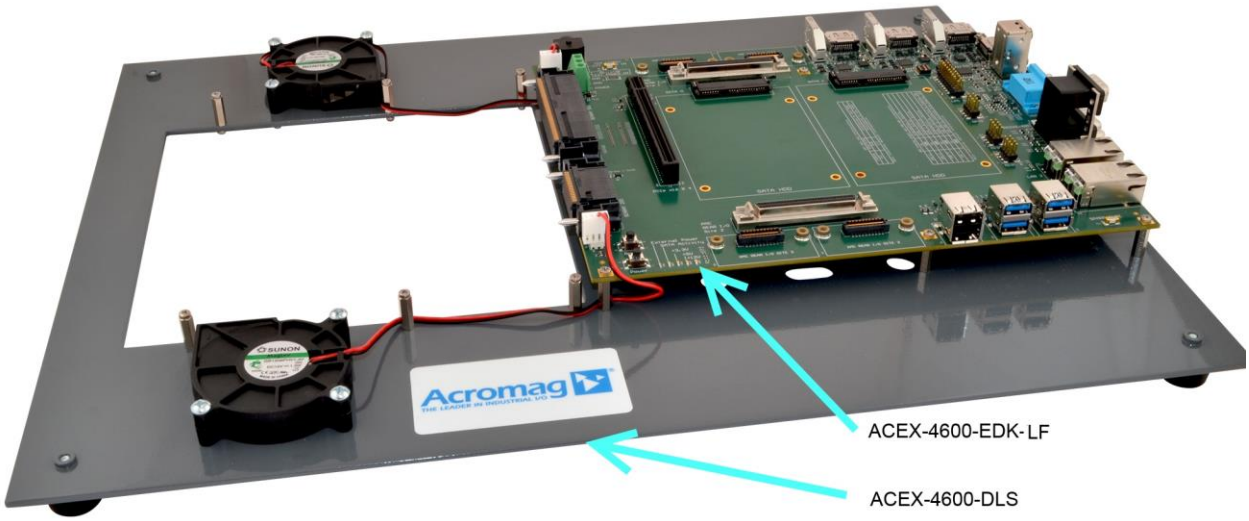
Active HeatSink **XHSA-6400**

Conduction Cool Kit

ACEX-CC-01



See Appendix A for installation instructions.



1.3.2 Key Features (All Models)

- Two USB 2.0 port routed to 500 pin Searay connector and two USB ports available at two mPCIe sites.
- Four USB 3.0 ports routed to 500 pin Searay connector.
- Two SATA ports routed to two SATA connectors.
- Three Digital Display Interface (DDI) ports are available for Display Port and HDMI/DVI interfaces. These ports are routed directly from the COM Express module to the 500-pin Searay connector.
- One VGA port is routed to 500 pin Searay connector.
- One Embedded Display (eDP) port or LVDS channel A signals can be

used and are routed to the 500 pin Searay connector.

- Two Gigabit LAN ports are routed to the 500 pin Searay connector. One with Ethernet signals coming direct from the COM Express and the other with Ethernet coming from an Ethernet controller.
- Four PCIe lanes are routed direct from COM Express to 500 pin Searay connector.
- Eight General Purpose I/O (4 input and 4 output) interfaces are routed from the COM Express to the 500 pin Searay connector.
- One Low Pin Count (LPC) bus interface is available for a range of low speed bus peripherals. This interface routes directly from the COM Express module to the 500-pin Searay connector.
- The carrier provides two RS232 or RS485 serial ports that are routed directly to the 500 pin Searay connector.
- One audio input and one audio output is routed from the carrier's audio codec to the 500 pin Searay connector.
- A fan PWM TACH control for fan speed control is routed to the Searay connector.
- An input voltage of 10VDC-36VDC to the carrier will be required and used to generate the necessary on-board voltage rails; +/-12V, 5V and 3.3V. The 3.3V power supply will be used to generate 1.2V, 1.5V and any other required voltages using LDO (low drop-out) regulators.
- Two miniPCIe/mSATA slots are available on the carrier.
- The ACEX-46xx carrier boards support either conduction cooling or air cooling.
- This carrier is designed to meet extended temperature range and military grade standards for shock and vibration.

1.3.3 Key Features (Models ACEX-4620 Only)

- The ACEX-4620 supports two PMC or XMC boards. The ACEX-4610 supports one PMC or XMC board.
- The ACEX-4620 supports a 200 pin secondary SEARAY connector to bring out PMC P4 and XMC P16 I/O signals.
- The increased available I/O connections of the ACEX-4620 board can provide additional I/O for required or optional features, and provide a complete test platform for the XCOM-6400.

1.4 Signal Interface Products

The ACEX-46XX family of carrier boards is intended to be used with a custom front panel. One example is the ACEX-FP-01front panel available for interface to the ACEX-4610 carrier. The ACEX-FP-01 is designed to accept a power filter bridge board as an option.

The ACEX-46XX family of carrier boards can also be used with the ACEX-EDK break-out development board. This board routes signals from the carrier's high-density connector to individual peripheral connectors for an easy interface to I/O devices.

1.5 Software Support

The ACEX-46XX family of carrier boards is intended to be used as a non-intelligent bridge between the system PCIe bus and the PMC/XMC module(s). No software is required to operate the board. However all PMC/XMC modules will require support drivers specific to your operating system. Refer to your PMC/XMC PCIe drivers.

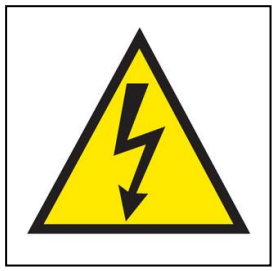
1.6 References

The following resources regarding COM Express modules, the XCOM46XX EDK board, and the Haswell© family of Intel® core processors are available for download on Acromag's website or by contacting your sales representative.

- COM Express Module Base Specification Rev. 2.1
  http://www.acromag.com
- APTIO™ Core BIOS Manual (for Acromag® Products featuring the Intel® 4th Generation "Haswell" Core Processor Family)
  http://www.acromag.com
- XCOM46XX Engineering Design Kit (EDK) Board
  http://www.acromag.com

2.0 PREPARATION FOR USE

IMPORTANT PERSONAL AND PRODUCT SAFETY CONSIDERATIONS



It is very important for the user to consider the possible safety implications of power, wiring, component, sensor, or software failures in designing any type of control or monitoring system. This is especially important where personal injury or the loss of economic property or human life is possible. It is important that the user employ satisfactory overall system design. It is understood and agreed by the Buyer and Acromag that this is the Buyer's responsibility.

WARNING: This board utilizes static sensitive components and should only be handled at a static-safe workstation. This product is an electrostatic sensitive device and is packaged accordingly. Do not open or handle this product except at an electrostatic-free workstation. Additionally, do not ship or store this product near strong electrostatic, electromagnetic, magnetic, or radioactive fields unless the device is contained within its original manufacturer's packaging. Be aware that failure to comply with these guidelines will void the Acromag Limited Warranty.

2.1 Unpacking and Inspecting

Upon receipt of this product, inspect the shipping carton for evidence of mishandling during transit. If the shipping carton is badly damaged or water stained, request that the carrier's agent be present when the carton is opened. If the carrier's agent is absent when the carton is opened and the contents of the carton are damaged, keep the carton and packing material for the agent's inspection.

For repairs to a product damaged in shipment, refer to the Acromag Service Policy to obtain return instructions. It is suggested that salvageable shipping cartons and packing material be saved for future use in the event the product must be shipped.

This board is physically protected with packing material and electrically protected with an anti-static bag during shipment. However, it is recommended that the board be visually inspected for evidence of mishandling prior to applying power.

2.2 Installation Considerations

Refer to the specifications section for loading and power requirements. Be sure that the system power supplies are able to accommodate the power requirements of the system boards, plus the installed Acromag board, within the voltage tolerances specified.

IMPORTANT: Adequate air circulation is required!

In an air cooled assembly, adequate air circulation must be provided to prevent a temperature rise above the maximum operating temperature and to prolong the life of the electronics. If the installation is in an industrial environment and the board is exposed to environmental air, careful consideration should be given to air-filtering.

In a conduction cooled assembly, adequate thermal conduction must be provided to prevent a temperature rise above the maximum operating temperature.

2.3 Non-Isolation Considerations

The board is non-isolated, since there is electrical continuity between the PCIe bus and COM Express module grounds. As such, the field I/O connections are not isolated from the system. Care should be taken in designing installations without isolation to avoid noise pickup and ground loops caused by multiple ground connections.

2.4 Dipswitch Settings

Shown in Figure 2.4.1 and Table 2.4.1 below are the dipswitch settings and serial port configurations. Dipswitch board location is shown in figure 3.14.1 in bottom right hand location.

Table 2.4.1 Dipswitch Settings and Serial Port Configurations

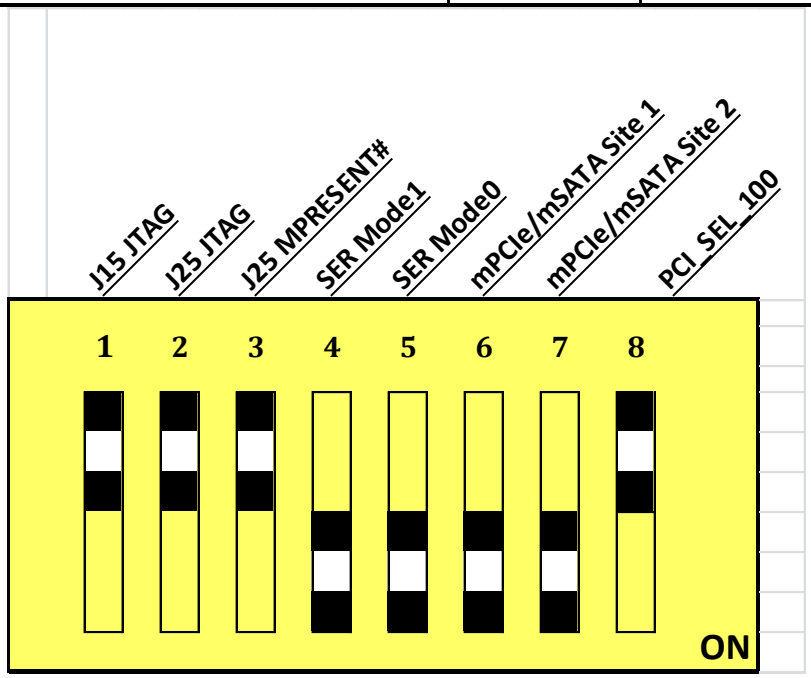
Bold indicates default setting		
1	ON	J15 JTAG voltage = 2.5Vdc
	OFF	**J15 JTAG voltage = 3.3Vdc**
2[1]	ON	J25 JTAG voltage = 2.5Vdc
	OFF	**J25 JTAG voltage = 3.3Vdc**
3[1]	ON	*J25 MPRESENT#, Signal low , Enable (XMC Site 2)*
	OFF	***J25 MPRESENT# , Signal High, Disable (XMC Site 2)***
4	**ON**	SER_MODE0 (see Serial Port Configuration below)
	OFF	SER_MODE0 (see Serial port configuration below)
5	**ON**	SER_MODE1 (see Serial Port Configuration below)
	OFF	SER_MODE1 (see Serial Port Configuration below)
6	**ON**	**mPCIe/mSATA site 1 = mPCIe enabled**
	OFF	mPCIe/mSATA site 1 = mSATA enabled
7	**ON**	**mPCIe/mSATA site 2 = mPCIe enabled**
	OFF	mPCIe/mSATA site 2 = mSATA enabled
8	ON	PCI_SEL_100 = 25, 50, 100MHz
	OFF	PCI_SEL_100 = 33, 66, 133MHz

Note 1: *Dipswitches 2 and 3 do not apply to the ACEX4610 models*

Serial Port Configuration	***SER_Mode0***	***SER_Mode1***
Dual RS-232	*0*	*0*

COM0: RS-232 / COM1:RS-485	*0*	*1*
Dual RS-485	*1*	*0*
Low Power Shutdown	*1*	*1*

Figure 2.4.1 Dipswitch Settings



Note 1: *Dipswitch 2 and 3 do not apply to the ACEX4610 models*

XMC and PMC Expansion Sites

XMC can be used in both Site 1 and Site 2. PMC can also be used in both Site 1 and Site 2. However **if an XMC is used with a PMC module, the XMC must be in Site 1 and the PMC must be in Site 2**. See Figure 3.14.1 for Site 1 and Site 2 locations.

If the PMC in Site 2 is not recognized, check Dipswitch setting 3 and make sure it is set to off.

3.0 HARDWARE INFORMATION

3.1 Carrier Board Block Diagrams

Fig. 3.1.1 Model ACEX-4610 Block Diagram

The block diagrams for the ACEX-46XX family of carrier boards are shown below in Figs. 3.1.1 and 3.1.2. These may be a helpful reference as you review the connector pin out tables in this section.

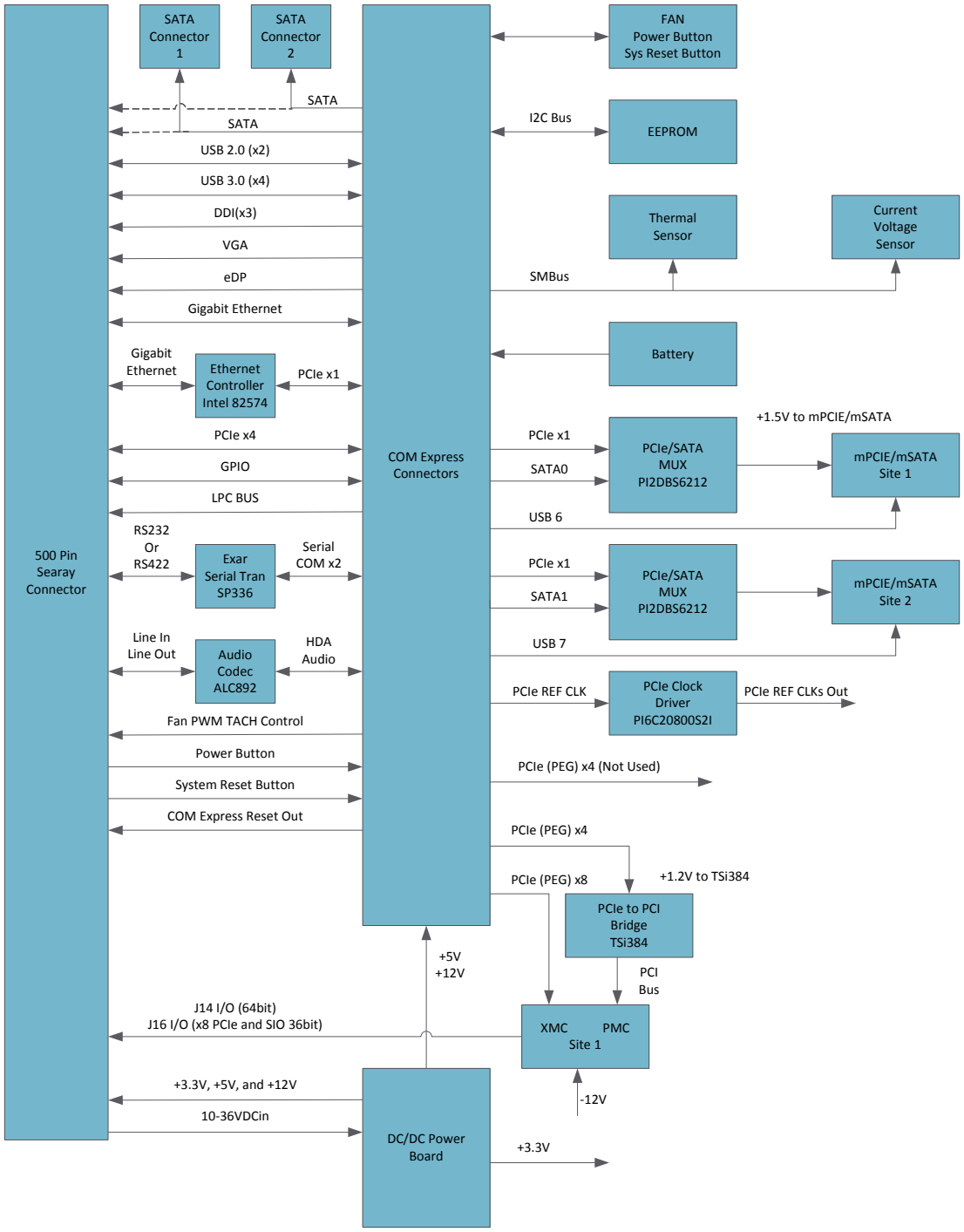
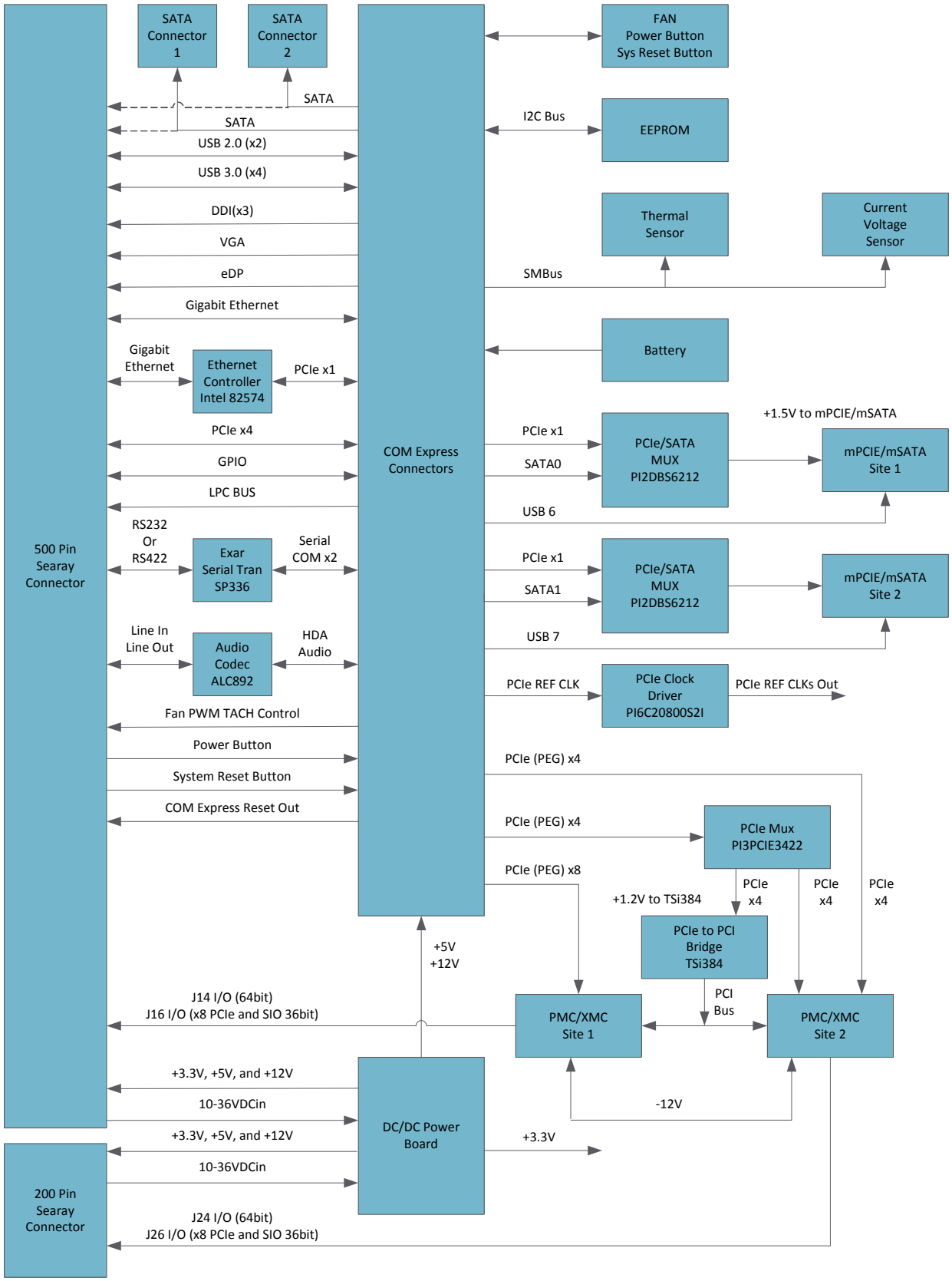


Fig. 3.1.2 Model ACEX-4620 Block Diagram


SATA Connector 1
SATA Connector 2
FAN Power Button Sys Reset Button
SATA
SATA
I2C Bus
EEPROM
USB 2.0 (x2)
USB 3.0 (x4)
DDI(x3)
Thermal Sensor
Current Voltage Sensor
VGA
eDP
SMBus
Gigabit Ethernet
Battery
Gigabit Ethernet
Ethernet Controller Intel 82574
PCIe x1
+1.5V to mPCIE/mSATA
PCIe x4
PCIe x1
PCIe/SATA MUX PI2DBS6212
mPCIE/mSATA Site 1
GPIO
SATA0
LPC BUS
USB 6
500 Pin Searay Connector
COM Express Connectors
RS232 Or RS422
Exar Serial Tran SP336
Serial COM x2
PCIe x1
PCIe/SATA MUX PI2DBS6212
mPCIE/mSATA Site 2
SATA1
Line In Line Out
Audio Codec ALC892
HDA Audio
USB 7
PCIe REF CLK
PCIe Clock Driver PI6C20800S2I
PCIe REF CLKs Out
Fan PWM TACH Control
Power Button
PCIe (PEG) x4
System Reset Button
COM Express Reset Out
PCIe (PEG) x4
PCIe Mux PI3PCIE3422
PCIe (PEG) x8
PCIe x4
PCIe x4
PCIe x4
+1.2V to TSi384
PCIe to PCI Bridge TSi384
+5V
+12V
PCI Bus
J14 I/O (64bit)
J16 I/O (x8 PCIe and SIO 36bit)
PMC/XMC Site 1
PMC/XMC Site 2
+3.3V, +5V, and +12V
-12V
10-36VDCin
DC/DC Power Board
+3.3V, +5V, and +12V
+3.3V
10-36VDCin
200 Pin Searay Connector
J24 I/O (64bit)
J26 I/O (x8 PCIe and SIO 36bit)

3.2 USB Channels

Four channels of USB 3.0 are available on USB channels 0 to 3 which are routed to the 500 pin Searay connector. In addition, two channels of USB 2.0 are available on channels 4 and 5 which are also routed to the 500 pin Searay connector. Two additional USB channels 6 and 7 are available on the mPCIe sites 1 and 2.

Table 3.2.1 USB Channels 0-3 (USB 3.0) Connector Pinouts

USB 3.0 Signal	Searay 500Pin	Description
USB0_+5V[1]	A21	USB Channel 0 Positive 5V from Carrier
USB0_P	B21	USB Channel 0 Differential Pair - "USB0+"
USB0_N	B22	USB Channel 0 Differential Pair - "USB0-"
USB1_+5V[1]	C21	USB Channel 1 Positive 5V from Carrier
USB1_P	D21	USB Channel 1 Differential Pair - "USB0+"
USB1_N	D22	USB Channel 1 Differential Pair - "USB0-"
USB2_+5V[1]	E21	USB Channel 2 Positive 5V from Carrier
USB2_P	F21	USB Channel 2 Differential Pair - "USB0+"
USB2_N	F22	USB Channel 2 Differential Pair - "USB0-"
USB3_P	B25	USB Channel 3 Differential Pair - "USB0+"
USB3_N	B26	USB Channel 3 Differential Pair - "USB0-"
USB3_+5V[1]	A25	USB Channel 3 Positive 5V from Carrier

Note 1: *Carrier board ground signals provided on Searay connector are given in Tables 3.26.1 and 3.26.2.*

The current monitoring and protection provided by the ACEX-4610/20 carrier boards is summarized below:

- USB channels 0 to 3 are USB 3.0, and are current monitored and protected up to 1A each.

- USB channels 4 and 5 are USB 2.0, and are current monitored and protected up to 0.5A each.

USB channels 6 and 7, which go to the mPCIe sites 1 and 2, require no current monitoring or protection.

Table 3.2.1 USB Channels 0 to 3 (USB 3.0) Connector Pinouts (continued)

USB 3.0 Signal	Searay 500Pin	Description
USB0_SSRX_P	J47	USB Channel 0 SuperSpeed Receive Positive
USB0_SSRX_N	J48	USB Channel 0 SuperSpeed Receive Negative
USB0_SSTX_P	K49	USB Channel 0 SuperSpeed Transmit Positive
USB0_SSTX_N	K50	USB Channel 0 SuperSpeed Transmit Negative
USB1_SSRX_P	G47	USB Channel 1 SuperSpeed Receive Positive
USB1_SSRX_N	G48	USB Channel 1 SuperSpeed Receive Negative
USB1_SSTX_P	H49	USB Channel 1 SuperSpeed Transmit Positive
USB1_SSTX_N	H50	USB Channel 1 SuperSpeed Transmit Negative
USB2_SSRX_P	J43	USB Channel 2 SuperSpeed Receive Positive
USB2_SSRX_N	J44	USB Channel 2 SuperSpeed Receive Negative
USB2_SSTX_P	K45	USB Channel 2 SuperSpeed Transmit Positive
USB2_SSTX_N	K46	USB Channel 2 SuperSpeed Transmit Negative
USB3_SSRX_P	G43	USB Channel 3 SuperSpeed Receive Positive
USB3_SSRX_N	G44	USB Channel 3 SuperSpeed Receive Negative
USB3_SSTX_P	H45	USB Channel 3 SuperSpeed Transmit Positive
USB3_SSTX_N	H46	USB Channel 3 SuperSpeed Transmit Negative

Table 3.2.2 USB Channels 4 and 5 (USB 2.0) Connector Pinouts

USB 2.0 Signal	Searay 500Pin	Description
USB4_+5V[1]	A29	USB Channel 4 Positive 5V from Carrier
USB4_P	B29	USB Channel 4 Differential Pair - "USB4+"
USB4_N	B30	USB Channel 4 Differential Pair - "USB4-"
USB5_+5V[1]	B31	USB Channel 5 Positive 5V from Carrier
USB5_P	C31	USB Channel 5 Differential Pair - "USB5+"
USB5_N	C32	USB Channel 5 Differential Pair - "USB5-"

Note 1: *Carrier board ground signals provided on Searay connector are given in Tables 3.26.1 and 3.26.2.*

3.3 SATA

The carrier references SATA ports as they are provided by the COM Express. It is SATA ports 2 and 3 from the COM Express that are routed to carrier on board SATA connectors 1 (J7) and 2 (J3) respectively as seen in figure 3.3.1. SATA ports 2 and 3 can optionally be routed to the 500 pin Searay connector.

Two additional SATA ports 0 and 1 are available on the mSATA sites 1 and 2 respectively.

The SATA connector is a seven conductor header. There are three grounds and four active data lines in two pairs. SATA 1 is labeled J7 on the carrier and SATA 2 is labeled J3 on the carrier. The carrier connector is Molex 67800-8005 socket.

Table 3.3.1 SATA 1 and SATA 2 Connectors

Pin Number	Signal Name	Function
1	GND	Ground
2	SATA_TX_P	Transmit +
3	SATA_TX_N	Transmit -
4	GND	Ground

5	SATA_RX_N	Receive -
6	SATA_RX_P	Receive +
7	GND	Ground

SATA Power Connector P17

The SATA power connector is a 4 pin conductor header. The SATA power connector is labeled P17 on the carrier. There is one ground and two power signals 5V, and +12V available on this connector. All power supplies are independently fused with a PolySwitch resettable device. At +12V the fuse is rated to 0.5A. The +5V is rated to 1.1A. A +3.3V supply is optionally available on Pin 3. Fuse F2 is currently open on the carrier and must be installed to bring +3.3V power to pin 3 of this connector. This connector is a Molex 470531000 header.

Table 3.3.2 SATA Power Connector

Pin Description	Number	Pin Description	Number
GND	1	+12V	2
+3.3V (OPEN)	3	+5V	4

Figure 3.3.1 SATA 1 (J7) and SATA 2 (J3) Locations

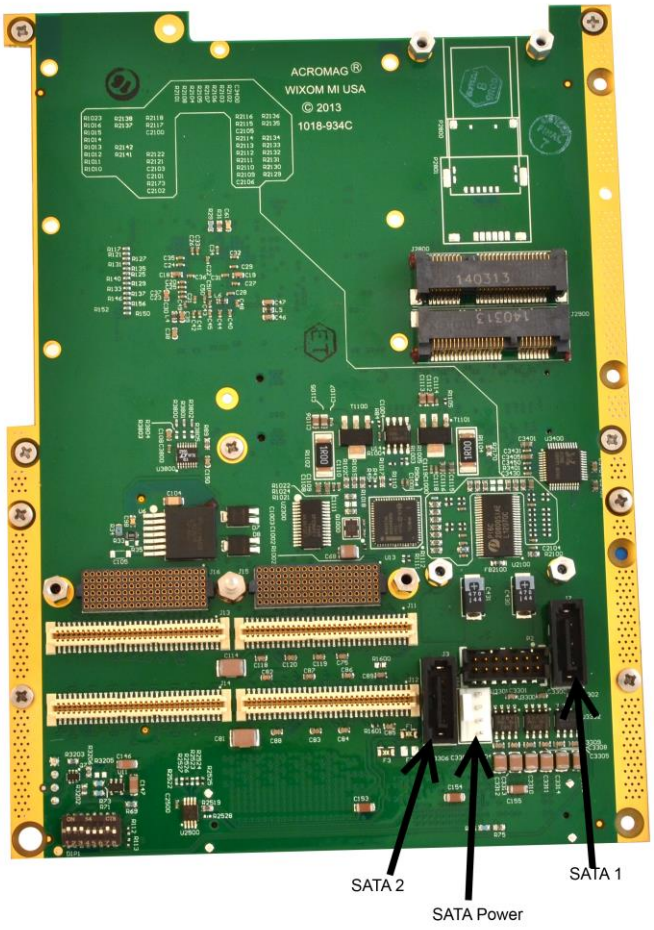


Table 3.3.3 SATA 2 (J7) and SATA 3 (J3) Searay Connector Pinouts Eight optional resistors (R170 – R177) must be added to the carrier to bring this SATA signals to the Searay connector.

SATA Signal	Searay 500Pin	Description
SATA_RX2_P	J40	SATA2 Receive Differential Pair Positive
SATA_RX2_N	J39	SATA2 Receive Differential Pair Negative
SATA_TX2_P	K42	SATA2 Transmit Differential Pair Positive
SATA_TX2_N	K41	SATA2 Transmit Differential Pair Negative
SATA_RX3_P	G40	SATA3 Receive Differential Pair Positive
SATA_RX3_N	G39	SATA3 Receive Differential Pair Negative
SATA_TX3_P	H42	SATA3 Transmit Differential Pair Positive
SATA_TX3_N	H41	SATA3 Transmit Differential Pair Negative

3.4 Digital Display Interface

Three Digital Display Interface (DDI) ports are available for Display Port and HDMI/DVI interfaces. DDI[1] can also support the SDVO interface. See Table 3.4.1 below for a summary of the DDI connectors.

Table 3.4.1 Digital Display Interface Connector Pinouts

DDI Signal	Searay 500 Pin	Description
DPB_CTRL_AUX_P	F38	DP AUX+ or HDMI/DVI I2C Ctrl Clk
DPB_CTRL_AUX_N	F37	DP AUX- or HDMI/DVI I2C Data
DPB_AUX_SEL	D36	Selects function of DPD_CTRL_AUX_P/N signals
DDB_HPD	D37	Hot Plug Detect
DPB_TX0_P	H38	Positive Differential Pair
DPB_TX0_N	H37	Negative Differential Pair
DPB_TX1_P	K38	Positive Differential Pair
DPB_TX1_N	K37	Negative Differential Pair
DPB_TX2_P	J36	Positive Differential Pair
DPB_TX2_N	J35	Negative Differential Pair
DPB_TX3_P	G36	Positive Differential Pair
DPB_TX3_N	G35	Negative Differential Pair
DPC_CTRL_AUX_P	E32	DP AUX+ or HDMI/DVI I2C Ctrl Clk
DPC_CTRL_AUX_N	E31	DP AUX- or HDMI/DVI I2C Data
DPC_AUX_SEL	B32	Selects function of DPD_CTRL_AUX_P/N signals
DPC_HPD	C33	Hot Plug Detect
DPC_TX0_P	D30	Positive Differential Pair
DPC_TX0_N	D29	Negative Differential Pair
DPC_TX1_P	F30	Positive Differential Pair
DPC_TX1_N	F29	Negative Differential Pair
DPC_TX2_P	E28	Positive Differential Pair
DPC_TX2_N	E27	Negative Differential Pair

Table 3.4.1 Digital Display Interface Connector Pinouts (continued)

DDI Signal	Searay 500 Pin	Description
DPC_TX3_P	C28	Positive Differential Pair
DPC_TX3_N	C27	Negative Differential Pair
DPD_CTRL_AUX_P	F34	DP AUX+ or HDMI/DVI I2C Ctrl Clk
DPD_CTRL_AUX_N	F33	DP AUX- or HDMI/DVI I2C Data
DPD_AUX_SEL	D33	Selects function of DPD_CTRL_AUX_P/N signals
DPD_HPD	D34	Hot Plug Detect
DPD_TX0_P	H34	Positive Differential Pair
DPD_TX0_N	H33	Negative Differential Pair
DPD_TX1_P	K34	Positive Differential Pair
DPD_TX1_N	K33	Negative Differential Pair
DPD_TX2_P	J32	Positive Differential Pair
DPD_TX2_N	J31	Negative Differential Pair
DPD_TX3_P	G32	Positive Differential Pair
DPD_TX3_N	G31	Negative Differential Pair

3.5 VGA

An analog RGB interface is available for CRT monitor and DDC support. Table 3.5.1 below summarizes the VGA connectors.

Table 3.5.1 VGA Connector Pinouts

VGA Signal	Searay 500 pin	Description
VGA_RED	B44	Red for monitor
VGA_GRN	B45	Green for monitor
VGA_BLU	B43	Blue for monitor
VGA_HSYNC	D45	Horizontal sync
VGA_VSYNC	D44	Vertical sync
VGA_I2C_CK	D46	DDC clock line

VGA_I2C_DAT	C46	DDC data line

3.6 eDP Embedded Display Port

One Embedded Display port or LVDS channel A signals can be alternatively used on this eDP (refer to Table 3.6.1 below).

Table 3.6.1 Embedded Display Port Connector Pinouts

eDP Signal	Searay 500 Pin	Description
EDP_TX0_P (LVDS_A2+)	E24	Positive Differential Pair
EDP_TX0_N (LVDS_A2-)	E23	Negative Differential Pair
EDP_TX1_P (LVDS_A1+)	D26	Positive Differential Pair
EDP_TX1_N (LVDS_A1-)	D25	Negative Differential Pair
EDP_TX2_P (LVDS_A0+)	F26	Positive Differential Pair
EDP_TX2_N (LVDS_A0-)	F25	Negative Differential Pair
EDP_TX3_P (LVDS_CK+)	C24	Positive Differential Pair
EDP_TX3_N (LVDS_CK-)	C23	Negative Differential Pair
EDP_HPD	A26	Hot Plug Detection
EDP_AUX_P (LVDS_I2C_CK)	H22	eDP AUX+
EDP_AUX_N (LVDS_I2C_DAT	H21	eDP AUX-
EDP_VDDEN (LVDS_VDD EN)	C22	eDP Power Enable
EDP_BKLTEN (LVDS BKLT EN)	A28	eDP Backlight Enable
EDP_BKLTCTL (LVDS BKLT CTRL)	A27	eDP Backlight Brightness Control

3.7 Gigabit Ethernet

Two Gigabit LAN ports are routed to the 500 pin Searay connector. One with Ethernet signals coming direct from the COM Express. The second Gigabit Ethernet channels is provided using a x1 PCIe lane from the Com Express to a carrier Intel 82574 PCIe PHY Ethernet controller. The Intel 82574 Ethernet Controller uses PCIe lane 5 from the Com Express module.

Table 3.7.1 Gigabit Ethernet Controller 0 direct from COM Express Module Connector Pinouts

Gigabit Ethernet Signal	Searay 500Pin	Description
GBE0_MDI3_P	A47	Controller 0 from Module - MDI Differential Pair 3 Positive
GBE0_MDI3_N	A48	Controller 0 from Module - MDI Differential Pair 3 Negative
GBE0_MDI2_P	B47	Controller 0 from Module - MDI Differential Pair 2 Positive
GBE0_MDI2_N	B48	Controller 0 from Module - MDI Differential Pair 2 Negative
GBE0_MDI1_P	C47	Controller 0 from Module - MDI Differential Pair 1 Positive
GBE0_MDI1_N	C48	Controller 0 from Module - MDI Differential Pair 1 Negative
GBE0_MDI0_P	D47	Controller 0 from Module - MDI Differential Pair 0 Positive
GBE0_MDI0_N	D48	Controller 0 from Module - MDI Differential Pair 0 Negative
GBE0_L1000#	E47	Controller 0 from Module - 1000 Mb/s Link Indicator
GBE0_LINK#	E49	Controller 0 from Module - Link Indicator
GBE0_ACT#	F49	Controller 0 from Module - Activity Indicator

Table 3.7.2 Gigabit Ethernet Controller 1 Connector Pinouts

Gigabit Ethernet Signal	Searay 500Pin	Description
GBE1_MDI3_P	A49	Controller 1 from Carrier - MDI Differential Pair 3 Positive
GBE1_MDI3_N	A50	Controller 1 from Carrier - MDI Differential Pair 3 Negative
GBE1_MDI2_P	B49	Controller 1 from Carrier - MDI Differential Pair 2 Positive
GBE1_MDI2_N	B50	Controller 1 from Carrier - MDI Differential Pair 2 Negative
GBE1_MDI1_P	C49	Controller 1 from Carrier - MDI Differential Pair 1 Positive
GBE1_MDI1_N	C50	Controller 1 from Carrier - MDI Differential Pair 1 Negative
GBE1_MDI0_P	D49	Controller 1 from Carrier - MDI Differential Pair 0 Positive
GBE1_MDI0_N	D50	Controller 1 from Carrier - MDI Differential Pair 0 Negative
GBE1_1V9	E48	External 1.9V Reference Voltage from Carrier for Gigabit Ethernet Controller 1
GBE1_LINK#	E50	Controller 1 from Carrier - Link Indicator
GBE1_ACT#	F50	Controller 1 from Carrier - Activity Indicator

3.8 PCIe x4

Four PCIe lanes are routed directly from COM Express to the 500 pin Searay connector

Table 3.8.1 PCIe x4 Connector Pinouts

PCIe Signal	Searay 500 Pin	Description
PCIE0_RX_P	G24	PCI Express Lane 0 Receive Differential Pair Positive
PCIE0_RX_N	G23	PCI Express Lane 0 Receive Differential Pair Negative
PCIE0_TX_P	H26	PCI Express Lane 0 Transmit Differential Pair Positive
PCIE0_TX_N	H25	PCI Express Lane 0 Transmit Differential Pair Negative
PCIE1_RX_P	J24	PCI Express Lane 1 Receive Differential Pair Positive
PCIE1_RX_N	J23	PCI Express Lane 1 Receive Differential Pair Negative
PCIE1_TX_P	K25	PCI Express Lane 1 Transmit Differential Pair Positive
PCIE1_TX_N	K26	PCI Express Lane 1 Transmit Differential Pair Negative
PCIE2_RX_P	G28	PCI Express Lane 2 Receive Differential Pair Positive
PCIE2_RX_N	G27	PCI Express Lane 2 Receive Differential Pair Negative
PCIE2_TX_P	H30	PCI Express Lane 2 Transmit Differential Pair Positive
PCIE2_TX_N	H29	PCI Express Lane 2 Transmit Differential Pair Negative
PCIE3_RX_P	J28	PCI Express Lane 3 Receive Differential Pair Positive
PCIE3_RX_N	J27	PCI Express Lane 3 Receive Differential Pair Negative
PCIE3_TX_P	K30	PCI Express Lane 3 Transmit Differential Pair Positive
PCIE3_TX_N	K29	PCI Express Lane 3 Transmit Differential Pair Negative

3.9 GPIO Connector Pinouts

Eight General Purpose I/O (4 input and 4 output) interfaces are available. See Table 3.9.1 below for a summary of the GPIO connectors.

Table 3.9.1 GPIO Connector Pinouts

GPIO Signal	Searay 500Pin	Description
GPI_0	D19	General Purpose Input 0
GPI_1	C20	General Purpose Input 1
GPI_2	B19	General Purpose Input 2
GPI_3	B20	General Purpose Input 3
GPO_0	B23	General Purpose Output 0
GPO_1	B24	General Purpose Output1
GPO_2	E20	General Purpose Output 2
GPO_3	D20	General Purpose Output 3

3.10 LPC Bus Interface Connector Pinouts

The Low Pin Count (LPC) bus interface is available for a range of low speed bus peripherals. This interface routes directly from the COM Express module to the 500-pin Searay connector. The LPC bus can provide legacy PC I/O functions, including PS2 keyboard and mouse ports, serial and parallel ports, and a floppy interface. Table 3.10.1 below summarizes the LPC bus connectors.

Table 3.10.1 LPC Bus Interface Connector Pinouts

LPC Interface	Searay 500 Pin	Description
LPC_AD0 LPC_AD1 LPC_AD2 LPC_AD3	E46 E45 F46 F45	LPC multiplexed address, command and data bus
LPC_FRAME#	F43	LPC frame indicates the start of a LPC cycle
LPC_DRQ0# (PCH_DRQ0#)	D42	LPC serial DMA request
LPC_DRQ1# (PCH_DRQ1#)	D41	LPC serial DMA request
LPC_SERIRQ (INT_SERIRQ)	E42	LPC serial interrupt
LPC_CLK (CK_PCI_LPC)	F42	LPC clock output

3.11 RS232/RS485

The carrier provides two RS232 or RS485 serial ports that are routed directly to the 500 pin Searay connector. See the dip switch selection section 2.4 for the serial port configuration options.

Table 3.11.1 RS232/RS422 Connector Pins

RS232/RS422 Signal	Searay 500 Pin	Description
UART_TX0_P	B33	General Purpose Serial Port 0 from Carrier Transmitter Positive
UART_TX0_N	B34	General Purpose Serial Port 0 from Carrier Transmitter Negative
UART_RX0_P	B35	General Purpose Serial Port 0 from Carrier Receiver Positive
UART_RX0_N	B36	General Purpose Serial Port 0 from Carrier Receiver Negative
UART_TX1_P	B37	General Purpose Serial Port 1 from Carrier Transmitter Positive
UART_TX1_N	B38	General Purpose Serial Port 1 from Carrier Transmitter Negative
UART_RX1_P	B39	General Purpose Serial Port 1 from Carrier Receiver Positive
UART_RX1_N	B40	General Purpose Serial Port 1 from Carrier Receiver Negative

3.12 Audio Codec

One audio input and one audio output is routed from the carrier's audio codec to the 500 pin Searay connector.

Table 3.12.1 Audio Codec Connector Pinouts

Audio Codec Signal	Searay 500 Pin	Description
LINE-IN_R	A44	Right Channel Audio Line In from CODEC on Carrier
LINE-IN_L	A45	Left Channel Audio Line In from CODEC on Carrier
LINE-OUT_R	A42	Right Channel Audio Line Out from CODEC on Carrier
LINE-OUT_L	B42	Left Channel Audio Line Out from CODEC on Carrier

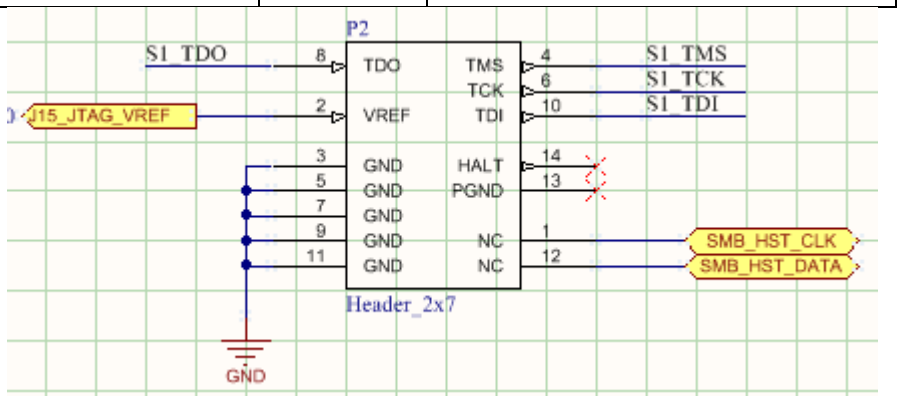
3.13 SMBus and I2C bus

The SMBus is optionally routed from the COM Express to the 500 pin Searay connector. Resistors R18 and R19 on the ACEX-4620 or R48 and R49 on the ACEX-4610 normally open must be installed to allow connection of the SMBus to the Searay connector. If these resistors are required for your application, it is strongly recommended that the board be returned to Acromag for installation of these zero ohm resistors.

Table 3.13.1 SMBus Connector Pinouts

SMBus Signal	Searay 500 Pin	Description
SMB_DATA	E39	System Management Bus Bidirectional Data Line
SMB_CLK	E40	System Management Bus Bidirectional Clock Line
SMB_ALERT#	E41	System Management Bus Alert Signal

SMBus is also brought out to the P2 connector on the carrier. The SMB Clock is available on pin 1 of P2 and the SMB Data is available on pin 12 of P2. The P2 connector is a Molex 2x7 header (Molex part number 87832-1420). The location of the P2 connector is shown in Figure 3.14.1 and is labeled "XMC Site 1 JTAG Connector".



3.13.2 I2C EEPROM

There is one EEPROM device U2700 on the I2C bus. Information such as board module number, part number and revision level can be stored in this location. Address line A0 to A2 are pulled to logic high, placing the device at address 0xAE (A6-A3 = 1010b for EEPROM devices).

3.13.3 SMBus Voltage/Current/ Temperature Sensor

This device U3800 is on the SMBus and will report board temperature as well as current and voltages for the +12, +5, and +3.3 volt supplies. Figure 3.14.1 shown below shows the location of this device under the PMC/XMC site 1. Address lines A0 to A2 are pulled to logic high.

Table 3.13.4 Current Reading Conversion Constants

The 12V_Current, 5v_Current, and 3p3v_Current signals are routed to U3800 an I2C analog to digital converter. The voltages present on these signals can be converted to a current reading in software with use of the following constants. For example voltage read at LTC2991 port V3 multiplied by 2.3 will give the 12volt supply current reading in amps.

Signal	Constant	LTC2991 Port
12v_Current	2.3	V3
5v_Current	2.5	V5
3p3v_Current	2.7	V7

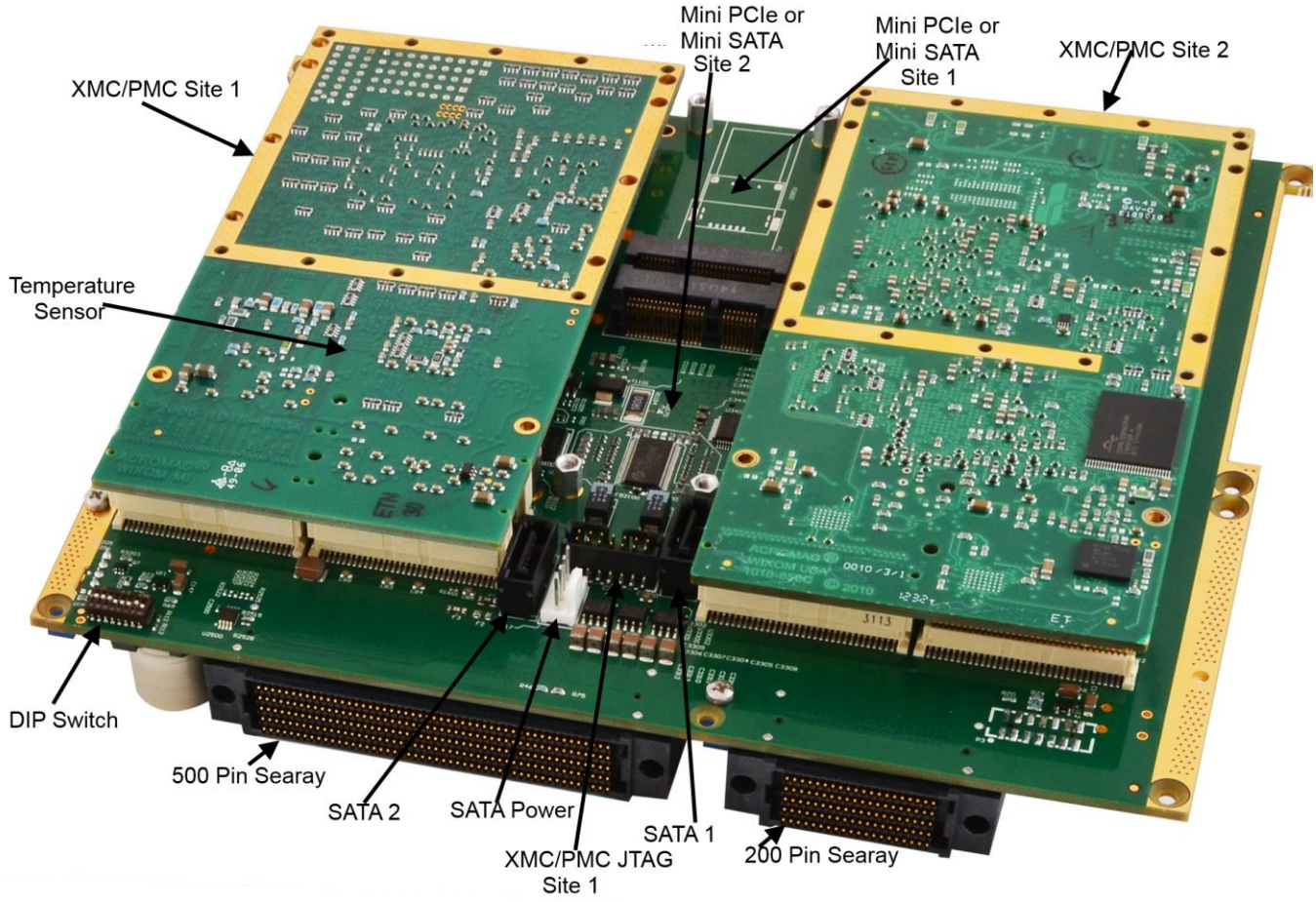
Table 3.13.5 Voltage Reading Conversion Constants

Other LTC2991 ports are used to provide a reading of the voltages of the input voltage, 12v, 5v, and 3.3v supplies. For example, the voltage read at the LTC2991 port V4 multiplied by 4.74 will give the 12volt supply voltage.

Signal	Constant	LTC2991 Port
Input Voltage	8.32	V1 and V2
12 Volt Supply	4.74	V4
5 Volt Supply	2.0	V6
3.3 Volt Supply	1.0	V8

3.14 Bottom Board Image

Fig. 3.14.1 Model ACEX-4620 Bottom Board Image



3.15 500 Pin Searay

The ACEX-4620/10 models all use one high speed 500 SEARAY connector that is shown in the picture above. This 500-pin connector can interface with ACEX-4600-EDK and other custom I/O panels. The carrier passes the peripheral signals from the COM Express CPU through this connector along with the PMC/XMC Site 1 Rear I/O signals.

3.16 200 Pin Searay

The smaller SEARAY connector is a 200-pin connector that is used to interface with the ACEX-4620 double-wide COM Express Carrier. The ACEX-4620 carrier passes the PMC/XMC Site 2 Rear I/O signals through this connector to the high-speed connectors shown in the diagram above. The single-wide ACEX-4610 carriers does not contain a second PMC/XMC Site and therefore does not make a connection with the 200-pin SEARAY connector.

3.17 Dual Function miniPCIe and mSATA Slots

The carrier has two dual function miniPCIe/mSATA slots. Each of the dual function slots can accept either a mini PCIe module or an mSATA module. These slots use a multiplexer circuit that allows for the selection between connecting the PCIe or SATA lane.

A USB 2.0 port is also provided as defined in the mini PCIe specification.

The mini PCIe/mSATA slots are designed for full length modules. With an adapter a half-length module can alternatively be installed. Board 6mm standoffs and M2.5 screws are provided with the carrier for installation of mini PCIe/mSATA modules. See image 3.14.1 for the mini PCIe and mSATA site 1 and 2 locations.

3.18 JTAG Program Header Connector Pinouts

Some PMC/XMC modules may utilize JTAG connections for FPGA programming or Chipscope debug activities. Individual JTAG connections are available for each site through the use of a Molex 2x7 header (Molex part number 87832-1420).

Acromag XMC FPGA boards can be configured to route the JTAG programming signals through the XMC P15 [XMC site 1] connector and XMC P25 [XMC site 2] connector.

The location of the P2 and P3 JTAG programming headers on the carrier board are shown in Fig. 3.14.1. The P2 JTAG connector connects to PMC/XMC in XMC site 1 on an ACEX-4610 or ACEX-4620 carrier board. The P3 JTAG connector connects to the PMC/XMC in XMC site 2 on an ACEX-4620 carrier board.

VREF can be set to either 2.5V or 3.3V. Setting "On" switch 1 of Dipswitch DIP1A selects 2.5V for VREF to XMC/PMC slot 1. Setting "On" switch 2 of Dip-switch DIP1A selects 2.5V for VREF to XMC/PMC slot 2. The switch left "Off" selects 3.3V. Please refer to Table 2.4.1 for more information on the Dip-switch settings and descriptions.

Table 3.4.2: P2 and P3 Programming Connector Pinouts

Pin Description	Number	Pin Description	Number
SMB CLK[2]	1	VREF	2
GND	3	TMS	4
GND	5	TCK	6
GND	7	TDO	8
GND	9	TDI	10
GND	11	SMB DATA[2]	12
NC[1]	13	NC[1]	14

Notes:

1. *NC – Not Connected*
2. *The P2 only has the SMB CLK and SMB DATA on pins 1 and 12. On the P3 pins 1 and 12 are NC.*

3.19 PMC/XMC Site 1 and Site 2 Slots

XMC and PMC Expansion Sites

XMC can be used in both Site 1 and Site 2. PMC can also be used in both Site 1 and Site 2. **However if an XMC is used with a PMC module, the XMC must be in Site 1 and the PMC must be in Site 2**. See Figure 3.14.1 for Site 1 and Site 2 locations.

The following tables list the board connections for the PMC/XMC Site 1 (ACEX-4610/20) and Site 2 (ACEX4620 only) connectors J11 to J24. The PMC connector pins tables are given first followed by the XMC connector pin tables.

Table 3.19.1: J11/J21 PMC PCI Signal Connector Pinouts

This connector provides PCI bus signals for PMC modules.

Pin Description	Number	Pin Description	Number
TCK	1	-12V	2
GND	3	INTA#	4
INTB#	5	INTC#	6
BUSMODE1#	7	+5V	8
INTD#	9	NC[1]	10
GND	11	+3.3VAUX	12
CLK	13	GND	14
GND	15	GNT#	16
REQ#	17	+5V	18
+3.3V	19	AD31	20
AD28	21	AD27	22
AD25	23	GND	24
GND	25	C/BE3#	26
AD22	27	AD21	28
AD19	29	+5V	30
+3.3V	31	AD17	32
FRAME#	33	GND	34
GND	35	IRDY#	36
DEVSEL#	37	+5V	38
PCIXCAP	39	LOCK#	40
NC[1]	41	NC[1]	42
PAR	43	GND	44
+3.3V	45	AD15	46
AD12	47	AD11	48
AD9	49	+5V	50
GND	51	C/BE0#	52
AD6	53	AD5	54
AD4	55	GND	56
+3.3V	57	AD3	58
AD2	59	AD1	60
AD0	61	+5V	62
GND	63	REQ64#	64

Notes: *NC – Not Connected*

Table 3.19.2: J12/J22 PMC PCI Signal Connector Pinouts

This connector provides PCI bus signals for PMC modules.

Pin Description	Number	Pin Description	Number
+12V	1	TRST#	2
TMS	3	TDO	4
TDI	5	GND	6
GND	7	NC[1]	8
NC[1]	9	NC[1]	10
BUSMODE2#	11	+3.3V	12
RST#	13	BUSMODE3#	14
+3.3V	15	BUSMODE4#	16
PME#	17	GND	18
AD30	19	AD29	20
GND	21	AD26	22
AD24	23	+3.3V	24
IDSEL	25	AD23	26
+3.3V	27	AD20	28
AD18	29	GND	30
AD16	31	C/BE2#	32
GND	33	NC[1]	34
TRDY#	35	+3.3V	36
GND	37	STOP#	38
PERR#	39	GND	40
+3.3V	41	SERR#	42
C/BE1#	43	GND	44
AD14	45	AD13	46
M66EN	47	AD10	48
AD8	49	+3.3V	50
AD7	51	NC[1]	52
+3.3V	53	NC[1]	54
NC[1]	55	GND	56
NC[1]	57	NC[1]	58
GND	59	NC[1]	60
ACK64#	61	+3.3V	62
GND	63	NC[1]	64

Notes:

1. NC – Not Connected

Table 3.19.3: J13/J23 PMC PCI Signal Connector Pinouts

This connector provides PCI bus signals for PMC modules.

Pin Description	Number	Pin Description	Number
NC[1]	1	GND	2
GND	3	C/BE7#	4
C/BE6#	5	C/BE5#	6
C/BE4#	7	GND	8
+3.3V	9	PAR64	10
AD63	11	AD62	12
AD61	13	GND	14
GND	15	AD60	16
AD59	17	AD58	18
AD57	19	GND	20
+3.3V	21	AD56	22
AD55	23	AD54	24
AD53	25	GND	26
GND	27	AD52	28
AD51	29	AD50	30
AD49	31	GND	32
GND	33	AD48	34
AD47	35	AD46	36
AD45	37	GND	38
+3.3V	39	AD44	40
AD43	41	AD42	42
AD41	43	GND	44
GND	45	AD40	46
AD39	47	AD38	48
AD37	49	GND	50
GND	51	AD36	52
AD35	53	AD34	54
AD33	55	GND	56
+3.3V	57	AD32	58
NC[1]	59	NC[1]	60
NC[1]	61	GND	62
GND	63	NC[1]	64

Notes*:*

1. NC – Not Connected

Table 3.19.4: J14 PMC PCI/X Signal Connector Pinouts

This connector provides user signals (via rear I/O) for PMC modules, and is routed to the 500 pin Searay connector. The Searay connector pin locations for these signals are given in the following table.

J14 Pin	Signal Name	Searay 500 Pin		J14 Pin	Signal Name	Searay 500 Pin
1	J14_RIO0_GCLK_P	D16		2	J14_RIO1_P	C9
3	J14_RIO0_GCLK_N	D15		4	J14_RIO1_N	C8
5	J14_RIO2_P	C11		6	J14_RIO3_P	D8
7	J14_RIO2_N	C10		8	J14_RIO3_N	D7
9	J14_RIO4_P	C16		10	J14_RIO5_P	C7
11	J14_RIO4_N	C17		12	J14_RIO5_N	C6
13	J14_RIO6_P	B10		14	J14_RIO7_P	B6
15	J14_RIO6_N	B9		16	J14_RIO7_N	B5
17	J14_RIO8_P	B17		18	J14_RIO9_P	C5
19	J14_RIO8_N	B18		20	J14_RIO9_N	C4
21	J14_RIO10_P	B8		22	J14_RIO11_P	D4
23	J14_RIO10_N	B7		24	J14_RIO11_N	D3
25	J14_RIO12_P	C15		26	J14_RIO13_P	C3
27	J14_RIO12_N	C14		28	J14_RIO13_N	C4
29	J14_RIO14_P	B3		30	J14_RIO15_P	D2
31	J14_RIO14_N	B4		32	J14_RIO15_N	D1
33	J14_RIO16_P	D12		34	J14_RIO17_P	B11
35	J14_RIO16_N	D11		36	J14_RIO17_N	B12
37	J14_RIO18_P	B2		38	J14_RIO19_P	A3
39	J14_RIO18_N	B1		40	J14_RIO19_N	A2
41	J14_RIO20_P	A7		42	J14_RIO21_P	A8
43	J14_RIO20_N	A6		44	J14_RIO21_N	A9
45	J14_RIO22_P	B13		46	J14_RIO23_P	A10
47	J14_RIO22_N	B14		48	J14_RIO23_N	A11
49	J14_RIO24_P	A4		50	J14_RIO25_P	A12
51	J14_RIO24_N	A5		52	J14_RIO25_N	A13
53	J14_RIO26_P	B15		54	J14_RIO27_P	A14
55	J14_RIO26_N	B16		56	J14_RIO27_N	A15
57	J14_RIO28_P	C12		58	J14_RIO29_P	A16
59	J14_RIO28_N	C13		60	J14_RIO29_N	A17
61	J14_RIO30_P	C18		62	J14_RIO31_GCLK_P	A18
63	J14_RIO30_N	C19		64	J14_RIO31_GCLK_N	A19

Table 3.19.5: J24 PMC PCI/X Signal Connector Pinouts

This connector provides user signals (via rear I/O) for PMC modules. These PMC rear I/O signals are routed to the 200 pin Searay connector. The pin assignments are given in the following table.

J24 Pin	Signal Name	Searay 200 Pin		J24 Pin	Signal Name	Searay 200 Pin
1	J24_RIO0_GCLK_P	D1		2	J24_RIO1_P	B1
3	J24_RIO0_GCLK_N	D2		4	J24_RIO1_N	B2
5	J24_RIO2_P	C2		6	J24_RIO3_P	A2
7	J24_RIO2_N	C3		8	J24_RIO3_N	A3
9	J24_RIO4_P	D3		10	J24_RIO5_P	B3
11	J24_RIO4_N	D4		12	J24_RIO5_N	B4
13	J24_RIO6_P	C4		14	J24_RIO7_P	A4
15	J24_RIO6_N	C5		16	J24_RIO7_N	A5
17	J24_RIO8_P	B5		18	J24_RIO9_P	C6
19	J24_RIO8_N	B6		20	J24_RIO9_N	C7
21	J24_RIO10_P	A6		22	J24_RIO11_P	D7
23	J24_RIO10_N	A7		24	J24_RIO11_N	D8
25	J24_RIO12_P	B7		26	J24_RIO13_P	C8
27	J24_RIO12_N	B8		28	J24_RIO13_N	C9
29	J24_RIO14_P	A8		30	J24_RIO15_P	B9
31	J24_RIO14_N	A9		32	J24_RIO15_N	B10
33	J24_RIO16_P	C10		34	J24_RIO17_P	A10
35	J24_RIO16_N	C11		36	J24_RIO17_N	A11
37	J24_RIO18_P	D11		38	J24_RIO19_P	B11
39	J24_RIO18_N	D12		40	J24_RIO19_N	B12
41	J24_RIO20_P	C12		42	J24_RIO21_P	A12
43	J24_RIO20_N	C13		44	J24_RIO21_N	A13
45	J24_RIO22_P	B13		46	J24_RIO23_P	C14
47	J24_RIO22_N	B14		48	J24_RIO23_N	C15
49	J24_RIO24_P	A14		50	J24_RIO25_P	D15
51	J24_RIO24_N	A15		52	J24_RIO25_N	D16
53	J24_RIO26_P	B15		54	J24_RIO27_P	C16
55	J24_RIO26_N	B16		56	J24_RIO27_N	C17
57	J24_RIO28_P	A16		58	J24_RIO29_P	B17
59	J24_RIO28_N	A17		60	J24_RIO29_N	B18
61	J24_RIO30_P	C18		62	J24_RIO31_GCLK_P	A18
63	J24_RIO30_N	C19		64	J24_RIO31_GCLK_N	A19

Table 3.19.6: XMC Site 1/Site 2 Connector J15/J25 XMC Signal Pinouts

This connector provides PCIe bus signals for XMC modules.

Pin	A	B	C	D	E	F
1	PET0p0	PET0n0	3.3V	PET0p1	PET0n1	VPWR
2	GND	GND	TRST#	GND	GND	MRSTI#
3	PET0p2	PET0n2	3.3V	PET0p3	PET0n3	VPWR
4	GND	GND	TCK	GND	GND	MRST0#
5	PET0p4	PET0n4	3.3V	PET0p5	PET0n5	VPWR
6	GND	GND	TMS	GND	GND	+12V
7	PET0p6	PET0n6	3.3V	PET0p7	PET0n7	VPWR
8	GND	GND	TDI	GND	GND	-12V
9	RFU	RFU	RFU	RFU	RFU	VPWR
10	GND	GND	TDO	GND	GND	GA0
11	PER0p0	PER0n0	MBIST#	PER0p1	PER0n1	VPWR
12	GND	GND	GA1	GND	GND	MPRESENT#
13	PER0p2	PER0n2	3.3V AUX	PER0p3	PER0n3	VPWR
14	GND	GND	GA2	GND	GND	MSDA
15	PER0p4	PER0n4	RFU	PER0p5	PER0n5	VPWR
16	GND	GND	MVMRO	GND	GND	MSCL
17	PER0p6	PER0n6	RFU	PER0p7	PER0n7	RFU
18	GND	GND	RFU	GND	GND	RFU
19	REFCLK+0	REFCLK-0	RFU	WAKE#	ROOT0#	RFU

Table 3.19.7: J16 XMC Signal Connector Pinouts

This connector provides user signals (via a rear I/O) for XMC modules. These signals are routed to the 500 pin Searay connector.

Signal Name	Description	J16 Pin Connector	500 Pin Searay Connector
J16_SIO1_N	XMC Site 1 Rear I/O Differential Pair "J16_SIO1-"	F18	D5
J16_SIO1_P	XMC Site 1 Rear I/O Differential Pair "J16_SIO1+"	F19	D6
J16_SIO8_P	XMC Site 1 Rear I/O Differential Pair "J16_SIO8+"	C11	D9
J16_SIO8_N	XMC Site 1 Rear I/O Differential Pair "J16_SIO8-"	C10	D10
J16_SIO12_P	XMC Site 1 Rear I/O Differential Pair "J16_SIO12+"	C7	D13
J16_SIO12_N	XMC Site 1 Rear I/O Differential Pair "J16_SIO12-"	C6	D14
J16_SIO16_P	XMC Site 1 Rear I/O Differential Pair "J16_SIO16+"	C3	D17
J16_SIO16_N	XMC Site 1 Rear I/O Differential Pair "J16_SIO16-"	C2	D18
J16_SIO2_N	XMC Site 1 Rear I/O Differential Pair "J16_SIO2-"	C16	E2
J16_SIO2_P	XMC Site 1 Rear I/O Differential Pair "J16_SIO2+"	C17	E3
J16_SIO3_P	XMC Site 1 Rear I/O Differential Pair "J16_SIO3+"	F17	E4
J16_SIO3_N	XMC Site 1 Rear I/O Differential Pair "J16_SIO3-"	F16	E5
J16_DP16_N	XMC Site 1 Rear I/O Differential Pair "J16_DP16-"	B17	E6
J16_DP16_P	XMC Site 1 Rear I/O Differential Pair "J16_DP16+"	A17	E7
J16_DP19_P	XMC Site 1 Rear I/O Differential Pair "J16_DP19+"	E19	E8
J16_DP19_N	XMC Site 1 Rear I/O Differential Pair "J16_DP19-"	D19	E9
J16_SIO9_P	XMC Site 1 Rear I/O Differential Pair "J16_SIO9+"	F11	E10
J16_SIO9_N	XMC Site 1 Rear I/O Differential Pair "J16_SIO9-"	F10	E11
J16_SIO0_GCLK_P	XMC Site 1 Rear I/O Differential Pair "J16_SIO0+"	C19	E12
J16_SIO0_GCLK_N	XMC Site 1 Rear I/O Differential Pair "J16_SIO0-"	C18	E13
J16_SIO13_P	XMC Site 1 Rear I/O Differential Pair "J16_SIO13+"	F7	E14
J16_SIO13_N	XMC Site 1 Rear I/O Differential Pair "J16_SIO13-"	F6	E15
J16_SIO15_P	XMC Site 1 Rear I/O Differential Pair "J16_SIO15+"	F5	E16
J16_SIO15_N	XMC Site 1 Rear I/O Differential Pair "J16_SIO15-"	F4	E17
J16_SIO17_P	XMC Site 1 Rear I/O Differential Pair "J16_SIO17+"	F3	E18
J16_SIO17_N	XMC Site 1 Rear I/O Differential Pair "J16_SIO17-"	F2	E19

Table 3.19.7: J16 XMC Signal Connector Pinouts (Continued)

Signal Name	Description	J16 Pin Connector	500 Pin Searay Connector
J16_DP17_N	XMC Site 1 Rear I/O Differential Pair "J16_DP17-"	E17	F1
J16_DP17_P	XMC Site 1 Rear I/O Differential Pair "J16_DP17+"	D17	F2
J16_DP11_N	XMC Site 1 Rear I/O Differential Pair "J16_DP11-"	E11	F5
J16_DP11_P	XMC Site 1 Rear I/O Differential Pair "J16_DP11+"	D11	F6
J16_DP07_N	XMC Site 1 Rear I/O Differential Pair "J16_DP07-"	E7	F9
J16_DP07_P	XMC Site 1 Rear I/O Differential Pair "J16_DP07+"	D7	F10
J16_SIO10_P	XMC Site 1 Rear I/O Differential Pair "J16_SIO10+"	C9	F13
J16_SIO10_N	XMC Site 1 Rear I/O Differential Pair "J16_SIO10-"	C8	F14
J16_DP02_N	XMC Site 1 Rear I/O Differential Pair "J16_DP02-"	B3	F17
J16_DP02_P	XMC Site 1 Rear I/O Differential Pair "J16_DP02+"	A3	F18
J16_DP00_N	XMC Site 1 Rear I/O Differential Pair "J16_DP00-"	B1	F19
J16_DP00_P	XMC Site 1 Rear I/O Differential Pair "J16_DP00+"	A1	F20
J16_SIO5_P	XMC Site 1 Rear I/O Differential Pair "J16_SIO5+"	F15	G3
J16_SIO5_N	XMC Site 1 Rear I/O Differential Pair "J16_SIO5-"	F14	G4
J16_DP08_N	XMC Site 1 Rear I/O Differential Pair "J16_DP08-"	B9	G7
J16_DP08_P	XMC Site 1 Rear I/O Differential Pair "J16_DP08+"	A9	G8
J16_DP09_N	XMC Site 1 Rear I/O Differential Pair "J16_DP09-"	E9	G11
J16_DP09_P	XMC Site 1 Rear I/O Differential Pair "J16_DP09+"	D9	G12
J16_DP05_N	XMC Site 1 Rear I/O Differential Pair "J16_DP05-"	E5	G15
J16_DP05_P	XMC Site 1 Rear I/O Differential Pair "J16_DP05+"	D5	G16
J16_DP01_N	XMC Site 1 Rear I/O Differential Pair "J16_DP01-"	E1	G19
J16_DP01_P	XMC Site 1 Rear I/O Differential Pair "J16_DP01+"	D1	G20
J16_DP15_N	XMC Site 1 Rear I/O Differential Pair "J16_DP15-"	E15	H1
J16_DP15_P	XMC Site 1 Rear I/O Differential Pair "J16_DP15+"	D15	H2
J16_DP13_N	XMC Site 1 Rear I/O Differential Pair "J16_DP13-"	E13	H5
J16_DP13_P	XMC Site 1 Rear I/O Differential Pair "J16_DP13+"	D13	H6
J16_SIO11_P	XMC Site 1 Rear I/O Differential Pair "J16_SIO11+"	F9	H9
J16_SIO11_N	XMC Site 1 Rear I/O Differential Pair "J16_SIO11-"	F8	H10
J16_DP04_N	XMC Site 1 Rear I/O Differential Pair "J16_DP04-"	B5	H13

Table 3.19.7: J16 XMC Signal Connector Pinouts (Continued)

Signal Name	Description	J16 Pin Connector	500 Pin Searay Connector
J16_DP04_N	XMC Site 1 Rear I/O Differential Pair "J16_DP04-"	B5	H13
J16_DP04_P	XMC Site 1 Rear I/O Differential Pair "J16_DP04+"	A5	H14
J16_SIO6_N	XMC Site 1 Rear I/O Differential Pair "J16_SIO6-"	C12	H17
J16_SIO6_P	XMC Site 1 Rear I/O Differential Pair "J16_SIO6+"	C13	H18
J16_SIO7_P	XMC Site 1 Rear I/O Differential Pair "J16_SIO7+"	F13	J3
J16_SIO7_N	XMC Site 1 Rear I/O Differential Pair "J16_SIO7-"	F12	J4
J16_SIO4_P	XMC Site 1 Rear I/O Differential Pair "J16_SIO4+"	C15	J7
J16_SIO4_N	XMC Site 1 Rear I/O Differential Pair "J16_SIO4-"	C14	J8
J16_DP06_N	XMC Site 1 Rear I/O Differential Pair "J16_DP06-"	B7	J11
J16_DP06_P	XMC Site 1 Rear I/O Differential Pair "J16_DP06+"	A7	J12
J16_DP03_N	XMC Site 1 Rear I/O Differential Pair "J16_DP03-"	E3	J15
J16_DP03_P	XMC Site 1 Rear I/O Differential Pair "J16_DP03+"	D3	J16
J16_DP12_N	XMC Site 1 Rear I/O Differential Pair "J16_DP12-"	B13	J19
J16_DP12_P	XMC Site 1 Rear I/O Differential Pair "J16_DP12+"	A13	J20
J16_DP18_N	XMC Site 1 Rear I/O Differential Pair "J16_DP18-"	B19	K1
J16_DP18_P	XMC Site 1 Rear I/O Differential Pair "J16_DP18+"	A19	K2
J16_DP14_N	XMC Site 1 Rear I/O Differential Pair "J16_DP14-"	B15	K5
J16_DP14_P	XMC Site 1 Rear I/O Differential Pair "J16_DP14+"	A15	K6
J16_DP10_N	XMC Site 1 Rear I/O Differential Pair "J16_DP10-"	B11	K9
J16_DP10_P	XMC Site 1 Rear I/O Differential Pair "J16_DP10+"	A11	K10
J16_SIO14_P	XMC Site 1 Rear I/O Differential Pair "J16_SIO14+"	C5	K13
J16_SIO14_N	XMC Site 1 Rear I/O Differential Pair "J16_SIO14-"	C4	K14
J16_SIO18_GCLK_P	XMC Site 1 Rear I/O Differential Pair "J16_SIO18+"	F1	K17
J16_SIO18_GCLK_N	XMC Site 1 Rear I/O Differential Pair "J16_SIO18-"	C1	K18

Table 3.19.8: J26 XMC Site 2 Signal Connector

This connector provides user signals (via a rear I/O) for XMC modules, and is routed to the 200 pin Searay connector.

Signal Name	Description	J26 Pin Connector	200 Pin Searay Connector
J26_SIO4_P	XMC Site 2 Rear I/O Differential Pair "J26_SIO4+"	C15	D5
J26_SIO4_N	XMC Site 2 Rear I/O Differential Pair "J26_SIO4-"	C14	D6
J26_SIO8_P	XMC Site 2 Rear I/O Differential Pair "J26_SIO8+"	C11	D9
J26_SIO8_N	XMC Site 2 Rear I/O Differential Pair "J26_SIO8-"	C10	D10
J26_SIO12_P	XMC Site 2 Rear I/O Differential Pair "J26_SIO12+"	C7	D13
J26_SIO12_N	XMC Site 2 Rear I/O Differential Pair "J26_SIO12-"	C6	D14
J26_SIO16_P	XMC Site 2 Rear I/O Differential Pair "J26_SIO16+"	C3	D17
J26_SIO16_N	XMC Site 2 Rear I/O Differential Pair "J26_SIO16-"	C2	D18
J26_SIO1_P	XMC Site 2 Rear I/O Differential Pair "J26_SIO1+"	F19	E2
J26_SIO1_N	XMC Site 2 Rear I/O Differential Pair "J26_SIO1-"	F18	E3
J26_SIO3_P	XMC Site 2 Rear I/O Differential Pair "J26_SIO3+"	F17	E4
J26_SIO3_N	XMC Site 2 Rear I/O Differential Pair "J26_SIO3-"	F16	E5
J26_SIO5_P	XMC Site 2 Rear I/O Differential Pair "J26_SIO5+"	F15	E6
J26_SIO5_N	XMC Site 2 Rear I/O Differential Pair "J26_SIO5-"	F14	E7
J26_SIO7_P	XMC Site 2 Rear I/O Differential Pair "J26_SIO7+"	F13	E8
J26_SIO7_N	XMC Site 2 Rear I/O Differential Pair "J26_SIO7-"	F12	E9
J26_SIO9_P	XMC Site 2 Rear I/O Differential Pair "J26_SIO9+"	F11	E10
J26_SIO9_N	XMC Site 2 Rear I/O Differential Pair "J26_SIO9-"	F10	E11
J26_SIO11_P	XMC Site 2 Rear I/O Differential Pair "J26_SIO11+"	F9	E12
J26_SIO11_N	XMC Site 2 Rear I/O Differential Pair "J26_SIO11-"	F8	E13
J26_SIO13_P	XMC Site 2 Rear I/O Differential Pair "J26_SIO13+"	F7	E14
J26_SIO13_N	XMC Site 2 Rear I/O Differential Pair "J26_SIO13-"	F6	E15
J26_SIO15_P	XMC Site 2 Rear I/O Differential Pair "J26_SIO15+"	F5	E16
J26_SIO15_N	XMC Site 2 Rear I/O Differential Pair "J26_SIO15-"	F4	E17
J26_SIO17_P	XMC Site 2 Rear I/O Differential Pair "J26_SIO17+"	F3	E18
J26_SIO17_N	XMC Site 2 Rear I/O Differential Pair "J26_SIO17-"	F2	E19
J26_SIO0_P	XMC Site 2 Rear I/O Differential Pair "J26_SIO0+"	C19	F1

Table 3.19.8: J26 XMC Site 2 Signal Connector (Continued)

Signal Name	Description	J26 Pin Connector	200 Pin Searay Connector
J26_SIO0_N	XMC Site 2 Rear I/O Differential Pair "J26_SIO0-"	C18	F2
J26_SIO2_P	XMC Site 2 Rear I/O Differential Pair "J26_SIO2+"	C17	F5
J26_SIO2_N	XMC Site 2 Rear I/O Differential Pair "J26_SIO2-"	C16	F6
J26_SIO6_P	XMC Site 2 Rear I/O Differential Pair "J26_SIO6+"	C13	F9
J26_SIO6_N	XMC Site 2 Rear I/O Differential Pair "J26_SIO6-"	C12	F10
J26_SIO10_P	XMC Site 2 Rear I/O Differential Pair "J26_SIO10+"	C9	F13
J26_SIO10_N	XMC Site 2 Rear I/O Differential Pair "J26_SIO10-"	C8	F14
J26_SIO14_P	XMC Site 2 Rear I/O Differential Pair "J26_SIO14+"	C5	F17
J26_SIO14_N	XMC Site 2 Rear I/O Differential Pair "J26_SIO14-"	C4	F18
J26_SIO18_P	XMC Site 2 Rear I/O Differential Pair "J26_SIO18+"	F1	F19
J26_SIO18_N	XMC Site 2 Rear I/O Differential Pair "J26_SIO18-"	C1	F20
J26_DP17_N	XMC Site 2 Rear I/O Differential Pair "J26_DP17-"	E17	G3
J26_DP17_P	XMC Site 2 Rear I/O Differential Pair "J26_DP17+"	D17	G4
J26_DP13_N	XMC Site 2 Rear I/O Differential Pair "J26_DP13-"	E13	G7
J26_DP13_P	XMC Site 2 Rear I/O Differential Pair "J26_DP13+"	D13	G8
J26_DP09_N	XMC Site 2 Rear I/O Differential Pair "J26_DP09-"	E9	G11
J26_DP09_P	XMC Site 2 Rear I/O Differential Pair "J26_DP09+"	D9	G12
J26_DP05_N	XMC Site 2 Rear I/O Differential Pair "J26_DP05-"	E5	G15
J26_DP05_P	XMC Site 2 Rear I/O Differential Pair "J26_DP05+"	D5	G16
J26_DP01_N	XMC Site 2 Rear I/O Differential Pair "J26_DP01-"	E1	G19
J26_DP01_P	XMC Site 2 Rear I/O Differential Pair "J26_DP01+"	D1	G20
J26_DP19_N	XMC Site 2 Rear I/O Differential Pair "J26_DP19-"	D19	H1
J26_DP19_P	XMC Site 2 Rear I/O Differential Pair "J26_DP19+"	E19	H2
J26_DP15_N	XMC Site 2 Rear I/O Differential Pair "J26_DP15-"	E15	H5
J26_DP15_P	XMC Site 2 Rear I/O Differential Pair "J26_DP15+"	D15	H6
J26_DP11_N	XMC Site 2 Rear I/O Differential Pair "J26_DP11-"	E11	H9
J26_DP11_P	XMC Site 2 Rear I/O Differential Pair "J26_DP11+"	D11	H10
J26_DP07_N	XMC Site 2 Rear I/O Differential Pair "J26_DP07-"	E7	H13
J26_DP07_P	XMC Site 2 Rear I/O Differential Pair "J26_DP07+"	D7	H14

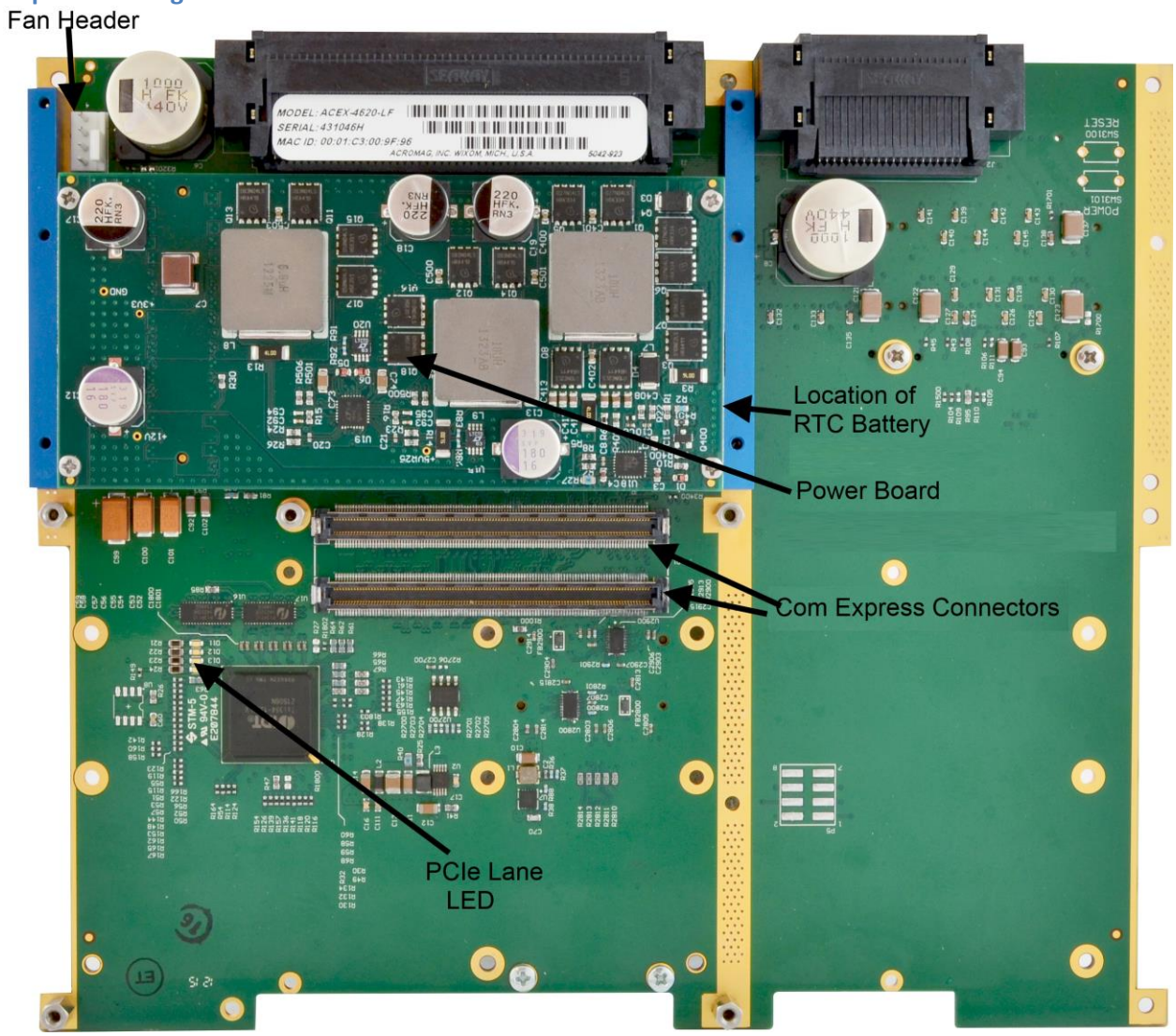
Table 3.19.8: J26 XMC Site 2 Signal Connector (Continued)

Signal Name	Description	J26 Pin Connector	200 Pin Searay Connector
J26_DP03_N	XMC Site 2 Rear I/O Differential Pair "J26_DP03-"	E3	H17
J26_DP03_P	XMC Site 2 Rear I/O Differential Pair "J26_DP03+"	D3	H18
J26_DP16_N	XMC Site 2 Rear I/O Differential Pair "J26_DP16-"	B17	J3
J26_DP16_P	XMC Site 2 Rear I/O Differential Pair "J26_DP16+"	A17	J4
J26_DP12_N	XMC Site 2 Rear I/O Differential Pair "J26_DP12-"	B13	J7
J26_DP12_P	XMC Site 2 Rear I/O Differential Pair "J26_DP12+"	A13	J8
J26_DP08_N	XMC Site 2 Rear I/O Differential Pair "J26_DP08-"	B9	J11
J26_DP08_P	XMC Site 2 Rear I/O Differential Pair "J26_DP08+"	A9	J12
J26_DP04_N	XMC Site 2 Rear I/O Differential Pair "J26_DP04-"	B5	J15
J26_DP04_P	XMC Site 2 Rear I/O Differential Pair "J26_DP04+"	A5	J16
J26_DP00_N	XMC Site 2 Rear I/O Differential Pair "J26_DP00-"	B1	J19
J26_DP00_P	XMC Site 2 Rear I/O Differential Pair "J26_DP00+"	A1	J20
J26_DP18_N	XMC Site 2 Rear I/O Differential Pair "J26_DP18-"	B19	K1
J26_DP18_P	XMC Site 2 Rear I/O Differential Pair "J26_DP18+"	A19	K2
J26_DP14_N	XMC Site 2 Rear I/O Differential Pair "J26_DP14-"	B15	K5
J26_DP14_P	XMC Site 2 Rear I/O Differential Pair "J26_DP14+"	A15	K6
J26_DP10_N	XMC Site 2 Rear I/O Differential Pair "J26_DP10-"	B11	K9
J26_DP10_P	XMC Site 2 Rear I/O Differential Pair "J26_DP10+"	A11	K10
J26_DP06_N	XMC Site 2 Rear I/O Differential Pair "J26_DP06-"	B7	K13
J26_DP06_P	XMC Site 2 Rear I/O Differential Pair "J26_DP06+"	A7	K14
J26_DP02_N	XMC Site 2 Rear I/O Differential Pair "J26_DP02-"	B3	K17
J26_DP02_P	XMC Site 2 Rear I/O Differential Pair "J26_DP02+"	A3	K18

3.20 Model ACEX-4620 Top Board Image

Please refer to this image as a reference for the following sections.

Fig. 3.20.1: Model ACEX-4620 Top Board Image



3.21 Cooling Fan

The COM Express module drives both the cooling fan tachometer control (Pin 3) and the cooling fan pulse width modulation control (Pin 4). Please refer to Table 3.21.1 below for more information on the pin numbers and descriptions.

Table 3.21.1: P10 Cooling Fan Control Connector Pins

Pin Description	Number	Pin Description	Number
GND	1	+12V	2
Tachometer	3	Control	4

Please refer to Table 3.21.2 below for information on the Searay 500 pin numbers and descriptions.

Table 3.21.2: Fan Control Connector Pins

Fan Control Signal	Searay 500 Pin	Description
FAN_TACH	A22	CPU Fan Tach Input
FAN_PWM	A23	CPU Fan Speed Control

3.22 Power Button

The power button on the carrier is left open and is not populated.

Table 3.22.1 Power Button Connector Pin

One power button signal is routed from COM Express module to the 500 pin Searay connector. When activated "logic low" is provided on the PWRBTN# signal. This will result in the Com Express driving signal S3# high thus powering up the system.

Power Button Signal	Searay 500 Pin	Description
PWRBTN#	F41	Power Button Input Signal

3.23 System Reset Button

The reset button on the carrier is left open and is not populated.

Table 3.23.1 System Reset Button Connector Pin

One system reset button signal is routed from COM Express module to the 500 pin Searay connector. When activated a system reset is sent to the COM Express CPU.

System Reset Button Signal	Searay 500 Pin	Description
SYSRST#	E1	System Reset Signal

3.24 RTC Battery

The Real Time Clock (RTC) battery is located under the power supply mezzanine board near the location shown in Figure 3.20.1. The RTC battery on the carrier board allows time of day and other system stored data to receive power even after powering down the system.

3.25 PCIe Lane LED

The LED indicators located next to the PCIe to PCI bridge chip (shown in Figure 3.20.1) provide the status of the PCIe lanes. These PCIe lane status LEDs report the number for active lanes x1 (D11), x2 (D11 and D12), or x4 (all four lanes D11 through D14).

3.26 Power Supply Module

The ACEX-46XX power supply module provides the +12 volt supply and +5V the standby supply to the Com Express board. In addition, +12 and +3.3 volts are provided to each of the XMC sites. To each of the PMC sites +5 and +3.3 volts are provided. The ACEX-46XX carrier itself generates -12 volt which is provided to the PMC sites.

The power supply module also provides +3.3 volts to each of the mPCIe/mSATA sites.

The power supply module is provided with purchase of the ACEX46XX carrier and comes installed as shown in figure. 3.20.1.

3.26.1 Power Management

- An input voltage of +10V to +36V DC to the carrier is required for proper operation and used to generate the necessary on-board voltage rails; +/-12V, 5V and 3V3 (i.e. 3.3 volts). From the 3V3 power supply 1V2 and 1V5 are generated.
- The +10V to +36V DC input power is received on the 500 pin Searay connector. Pins A30 to A39. A maximum 175W supply is needed to provide this input power.
- The +5V and +3.3V supplies come up with the +10V to +36V input power. The +5V supply is designed to provide 9A of current. The +3.3V supply is designed to provide 10A of current. Note that the +5V standby supply will continue to provide power to the Com Express module as long as the +10V to +36V DC input voltage is provided.
- The +12V power supply is enabled by the Com Express CPU. The carriers allow the management of power via the Com Express and its operating system. The carrier uses the S3# State signal from the Com Express to control the state of the +12 power supply. When the Com Express leaves state 3, that is when S3# goes high, the +12

power supply is enabled and provides +12V power. The +12V supply is designed to provide 7A of current.

- The -12V power supply uses the +12V power to generate the -12V. The -12V supply is designed to provide 1A of current.
- From the +5V and +3.3V supplies the +5V load and +3.3V load supply voltages are generated. These load supplies are enabled by the Com Express CPU. The State 3 signal PM_SLP_S3# from the CPU, when logic high enables these load supplies.
- A 1.5V supply is generated from the +3.3V load power. The 1.5V power is used to power the mSATA/mPCIe sites. A maximum of 1A of current is available from the 1.5V supply.
- A 1.2V supply is also generated from the +3.3V load power. The 1.2V power is used to power the TSi384 PCIe to PCI bridge chip.

Table 3.26.1 Searay 500 Pin Power Supply Connector Pins

Power Supply	Searay 500 Pin	Description
10 to 36VDCin	A30 to A39	Input Power Supply 10 to
+12V	A20	Plus 12 Volt Supply
5V_LOADS	A40, C38, C39	Plus 5 Volt Supply
3.3V_LOADS	C41, D43, E44	Plus 3.3 Volt Supply
GND	A1, A41, A46, B27, B28, B41, B46, C25, C26, C29, C30, C42 to C45, D23, D24, D27, D28, D31, D32, E22, E25, E26, E29, E30, E33, E34, E37, E38, F3, F4, F7, F8, F11, F12, F15, F16, F23, F24, F27, F28, F31, F32, F35, F36, F39, F40, F43, F44, F47, F48, G1, G2, G5, G6, G9, G10, G13, G14, G17, G18, G25, G26, G29, G30, G33, G34, G37, G38, G41, G42, G45, G46, G49, G50, H3, H4, H7, H8, H11, H12, H15, H16, H19, H20, H23, H24, H27, H28, H31 H32, H35, H36, H39, H40, H43, H44, H47, H48, J1, J2, J5, J6, J9, J10, J13, J14, J17, J18, J21, J22, J25, J26, J29, J30, J33, J34, J37, J38, J41, J42, J45, J46, J49, J50, K3, K4, K7, K8, K11, K12, K15, K16, K19, K20, K23, K24, K27, K28, K31, K32, K35, K36, K39, K40, K43, K44, K47, K48	Ground Signals

Table 3.26.2 Searay 200 Pin Power Supply Connector Pins

The 200 pin Searay Connector is only available on the ACEX4620 Carrier

Signal	Searay 200 Pin	Description
10-36VDCin	A20, B20	Input Power Supply 10 to 36 volts
+12V	C20, D20	Plus 12 Volt Supply
5V_LOADS	A1, E20	Plus 5 Volt Supply
3.3V_LOADS	C1, E1	Plus 3.3 Volt Supply
GND	G1, G2, G5, G6, G9, G10, G13, G14, G17, G18, K3, K4, K7, K8, K11, K12, K15, K16, K19, K20, H3, H4, H7, H8, H11, H12, H15, H16, H19, H20, F3, F4, F7, F8, F11, F12, F15, F16, J1, J2, J5, J6, J9, J10, J13, J14, J17, J18	Ground Signals

Table 3.26.3 Mezzanine Board Power Supply Connector Pins

This connector provides Mezzanine Power Board to Carrier interconnect.

Pin Description	Number	Pin Description	Number
+12	1	PWRGD_COM	2
GND	3	+12	4
+12	5	GND	6
GND	7	+12	8
12v_Current	9	+12_Reg_Run	10
GND	11	+5V	12
+5V	13	GND	14
GND	15	+5V	16
+5V	17	GND	18
GND	19	5v_Current	20
+3.3V	21	GND	22
GND	23	+3.3V	24
+3.3V	25	GND	26
3.3v_Current	27	+3.3V	28
10-36VDCin	29	GND	30
GND	31	10-36VDCin	32
10-36VDCin	33	GND	34
GND	35	10-36VDCin	36
10-36VDCin	37	GND	38
10-36VDCin	39	10-36VDCin	40

3.27 COM Express Connector

The processor and Peripheral Controller Hub (PCH) chipset are present on the COM Express Type 6 CPU module. The COM Express connector pinouts are shown in Table 3.27.1.

Table 3.27.1 COM Express Connector Table

Pin	Row A	Row B	Row C	Row D
1	GND	GND	GND	GND
2	GBE0_MDI3-	GBE0_ACT#	GND	GND
3	GBE0_MDI3+	LPC_FRAME#	USB_SSRX0-	USB_SSTX0-
4	GBE0_LINK100#	LPC_AD0	USB_SSRX0+	USB_SSTX0+
5	GBE0_LINK1000#	LPC_AD1	GND	GND
6	GBE0_MDI2-	LPC_AD2	USB_SSRX1-	USB_SSTX1-
7	GBE0_MDI2+	LPC_AD3	USB_SSRX1+	USB_SSTX1+
8	GBE0_LINK#	NO CONNECT[1]	GND	GND
9	GBE0_MDI1-	LPC_DRQ1#	USB_SSRX2-_	USB_SSTX2-
10	GBE0_MDI1+	LPC_CLK	USB_SSRX2+	USB_SSTX2+
11	GND	GND	GND	GND
12	GBE0_MDI0-	PWRBTN#	USB_SSRX3-	USB_SSTX3-
13	GBE0_MDI0+	SMB_CK	USB_SSRX3+	USB_SSTX3+
14	NO CONNECT	SMB_DAT	GND	GND
15	SUS_S3#	SMBALERT#	NO CONNECT[1]	DDI1_CTRLCLK_AUX+
16	SATA0_TX+	SATA1_TX+	NO CONNECT[1]	DDI1_CTRLDATA_AUX-
17	SATA0_TX-	SATA1_TX-	NO CONNECT	NO CONNECT
18	SUS_S4#	SUS_STAT#	NO CONNECT	NO CONNECT
19	SATA0_RX+	SATA1_RX+	PCIE_RX6+	PCIE_TX6+
20	SATA0_RX-	SATA1_RX-	PCIE_RX6-	PCIE_TX6-
21	GND	GND	GND	GND
22	SATA2_TX+	SATA3_TX+	NO CONNECT[1]	NO CONNECT[1]
23	SATA2_TX-	SATA3_TX-	NO CONNECT[1]	NO CONNECT[1]
24	SUS_S5#	PWR_OK	DDI1 HPD	NO CONNECT
25	SATA2_RX+	SATA3_RX+	NO CONNECT[1]	NO CONNECT
26	SATA2_RX-	SATA3_RX-	NO CONNECT[1]	DDI1_PAIR0+
27	BATLOW#	WDT	NO CONNECT	DDI1_PAIR0-
28	SATA_ACT#	HAD_SDIN2	NO CONNECT	NO CONNECT
29	HAD_SYNC	HAD_SDIN1	NO CONNECT[1]	DDI1_PAIR1+

Table 3.27.1 COM Express Connector Table(Continued)

Pin	Row A	Row B	Row C	Row D
30	HAD_RST#	HAD_SDIN0	NO CONNECT[1]	DDI1_PAIR1-
31	GND	GND	GND	GND
32	HDA_BITCLK	SPKR	DDI2_CTRLCLK_AUX+	DDI1_PAIR2+
33	HDA_SDOUT	I^2C_CK	DDI2_CTRLDATA_AUX-	DDI1_PAIR2-
34	NO CONNECT[1]	1^2C_DAT	DDI2_DDC_AUX_SEL	DDI1_DDC_AUX_SEL
35	THRMTRIP#	THRM#	NO CONNECT	NO CONNECT
36	USB6-	USB7-	DDI3_CTRLCLK_AUX+	DDI1_PAIR3+
37	USB6+	USB7+	DDI3_CTRLDATA_AUX-	DDI1_PAIR3-
38	USB_6_7_OC#	USB_4_5_OC#	DDI3_DDC_AUX_SEL	NO CONNECT
39	USB4-	USB5-	DDI3_PAIR0+	DDI2_PAIR0+
40	USB4+	USB5+	DDI3_PAIR0-	DDI2_PAIR0-
41	GND	GND	GND	GND
42	USB2-	USB3-	DDI3_PAIR1+	DDI2_PAIR1+
43	USB2+	USB3+	DDI3_PAIR1-	D012_PAIR1-
44	USB_2_3_OC#	USB_0_1_OC#	DDI3_HPD	DDI2_HPD
45	USB0-	USB1-	NO CONNECT	NO CONNECT
46	USB0+	USB1+	DDI3_PAIR2+	DDI2_PAIR2+
47	VCC_RTC	NO CONNECT[1]	DDI3_PAIR2-	DDI2_PAIR2-
48	NO CONNECT[1]	NO CONNECT[1]	NO CONNECT	NO CONNECT
49	NO CONNECT[1]	SYS_RESET#	DDI3_PAIR3+	DDI2_PAIR3+
50	LPC_SERIRQ	CB_RESET#	D013_PAIR3-	DDI2_PAIR3-
51	GND	GND	GND	GND
52	PCIE_TX5+	PCIE_RX5+	PEG_RX0+	PEG_TX0+
53	PCIE_TX5-	PCIE_RX5-	PEG_ RX0-	PEG_ TX0-
54	GPI0	GPO1	TYPE0# (NO CONNECT)	PEG_ LANE_RV#
55	PCIE_TX4+	PCIE_RX4+	PEG_ RX1+	PEG_ TX1+
56	PCIE_TX4-	PCIE_RX4-	PEG_ RX1-	PEG_ TX1-
57	GND	GPO2	TYPE1# (NO CONNECT)	TYPE2# (GND)
58	PCIE_TX3+	PCIE_RX3+	PEG_ RX2+	PEG_ TX2+
59	PCIE_TX3-	PCIE_RX3-	PEG_ RX2-	PEG_ TX2-
60	GND	GND	GND	GND
61	PCIE_TX2+	PCIE_RX2+	PEG_ RX3+	PEG_ TX3+

Table 3.27.1 COM Express Connector Table (Continued)

Pin	Row A	Row B	Row C	Row D
62	PCIE_TX2-	PCIE_RX2-	PEG_ RX3-	PEG_ TX3-
63	GPI1	GPO3	NO CONNECT	NO CONNECT
64	PCIE_TX1+	PCIE_RX1+	NO CONNECT	NO CONNECT
65	PCIE_TX1-	PCIE_RX1-	PEG_ RX4+	PEG_TX4+
66	GND	WAKE0#	PEG_ RX4-	PEG_TX4-
67	GPI2	WAKE1#	NO CONNECT	GND
68	PCIE_TX0+	PCIE_RX0+	PEG_ RX5+	PEG_TX5+
69	PCIE_TX0-	PCIE_RX0-	PEG_ RX5-	PEG_TX5-
70	GND	GND	GND	GND
71	NO CONNECT	NO CONNECT[1]	PEG_ RX6+	PEG_TX6+
72	NO CONNECT	NO CONNECT[1]	PEG_ RX6-	PEG_TX6-
73	eDP_TX1+	NO CONNECT[1]	GND	GND
74	eDP_TX1-	NO CONNECT[1]	PEG_ RX7+	PEG_TX7+
75	eDP_TX0+	NO CONNECT[1]	PEG_ RX7-	PEG_TX7-
76	eDP_TX0-	NO CONNECT[1]	GND	GND
77	eDP_VDD_EN	NO CONNECT[1]	NO CONNECT	NO CONNECT
78	NO CONNECT	NO CONNECT[1]	PEG_RX8+	PEG_TX8+
79	NO CONNECT	eDP_BKLT_EN	PEG_RX8-	PEG_TX8-
80	GND	GND	GND	GND
80	GND	GND	GND	GND
81	NO CONNECT	NO CONNECT[1]	PEG_RX9+	PEG_TX9+
82	NO CONNECT	NO CONNECT[1]	PEG_RX9-	PEG_TX9-
83	eDP_AUX+	eDP_BKLT_CTRL	NO CONNECT	NO CONNECT
84	eDP_AUX-	VCC_5V_SBY	GND	GND
85	GPI3	VCC_5V_SBY	PEG_RX10+	PEG_TX10+
86	NO CONNECT	VCC_5V_SBY	PEG_RX10-	PEG_TX10-
87	eDP_HPD	VCC_5V_SBY	GND	GND
88	PCIE_CLK_REF	NO CONNECT[1]	PEG_RX11+	PEG_TX11+
89	PCIE_CLK_REF	VGA_RED	PEG_RX11-	PEG_TX11-
90	GND	GND	GND	GND
91	SPI_POWER	VGA_GRN	PEG_RX12+	PEG_TX12+
92	SPI_MISO	VGA_BLU	PEG_RX12-	PEG_TX12-
93	GPO0	VGA_HSYNC	GND	GND

Table 3.27.1 COM Express Connector Table (Continued)

Pin	Row A	Row B	Row C	Row D
94	SPI_CLK	VGA_VSYNC	PEG_RX13+	PEG_TX13+
95	SPI_MOSI	VGA_I^{2}C_CK	PEG_RX13-	PEG_TX13-
96	NO CONNECT[1]	VGA_I^{2}C_DAT	GND	GND
97	TYPE10# (NO CONNECT)	SPI_CS1#	NO CONNECT	NO CONNECT
98	SER0_TX	NO CONNECT	PEG_RX14+	PEG_TX14+
99	SER0_RX	NO CONNECT	PEG_RX14-	PEG_TX14-
100	GND	GND	GND	GND
101	SER1_TX	FAN_PWMOUT	PEG_RX15+	PEG_TX15+
102	SER1_RX	FAN_TACHIN	PEG_RX15-	PEG_TX15-
103	NO CONNECT[1]	NO CONNECT[1]	GND	GND
104	VCC_12V	VCC_12V	VCC_12V	VCC_12V
105	VCC_12V	VCC_12V	VCC_12V	VCC_12V
106	VCC_12V	VCC_12V	VCC_12V	VCC_12V
107	VCC_12V	VCC_12V	VCC_12V	VCC_12V
108	VCC_12V	VCC_12V	VCC_12V	VCC_12V
109	VCC_12V	VCC_12V	VCC_12V	VCC_12V
110	GND	GND	GND	GND

For detailed signal descriptions, refer to the COM-Express Module Base Specification Rev. 2.1

Note 1*: (NO CONNECT)* The functionality of the signals on these pins as described in the COM Express Module Base Specification Rev. 2.1 is not available on the XCOM-6400 module.

4.0 SERVICE AND REPAIR

4.1 Service and Repair Assistance

Surface-Mounted Technology (SMT) boards like the ACEX-46XX family of carrier boards are generally difficult to repair. The board can be easily damaged unless special SMT repair and service tools are used. For these and other reasons, it is strongly recommended that a non-functioning board be returned to Acromag for repair. Acromag has automated diagnostic and test equipment that thoroughly checks the performance of suspect boards. Furthermore, when any repair is made, the board is retested before return shipment to the customer.

Please refer to Acromag's Service Policy Bulletin or contact Acromag for complete details on how to obtain parts, or return parts for repair.

4.2 Preliminary Service Procedure

CAUTION: POWER MUST BE TURNED OFF BEFORE SERVICING BOARDS

Before beginning repair, be sure that all of the procedures in the "Preparation for Use" section have been followed. Also, refer to the documentation of your carrier board to verify that it is correctly configured. Replacement of the board with one that is known to work correctly is a good technique for isolating a faulty part.

4.3 Where to Get Help

If you continue to have problems, your next step should be to visit the Acromag worldwide web site at http://www.acromag.com. Our web site contains the most up-to-date product and software information.

Go to the "Support" tab to access:

- Application Notes
- Frequently Asked Questions (FAQ's)
- Product Knowledge Base
- Tutorials
- Software Updates/Drivers

Acromag's application engineers can also be contacted directly for technical assistance via email, telephone, or FAX through the contact information listed below. Note that an email question can also be submitted from within the Knowledge Base or directly from the "Contact Us" tab. When needed, complete repair services are also available.

- Email: solutions@acromag.com
- Phone: 248-295-0310

5.0 SPECIFICATIONS

5.1 Physical

Height: 33.3 mm (1.31 in)

Height including all metalwork but not XMC or PMC module

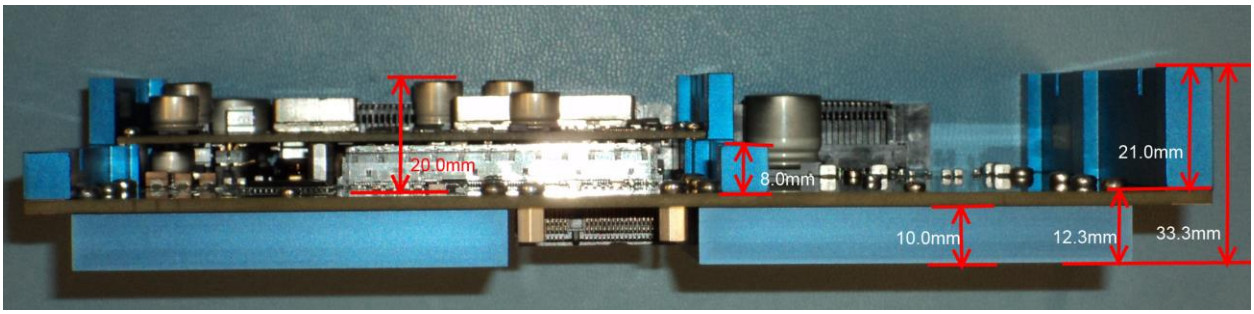
Board Thickness 2.3 mm (0.0905 in)

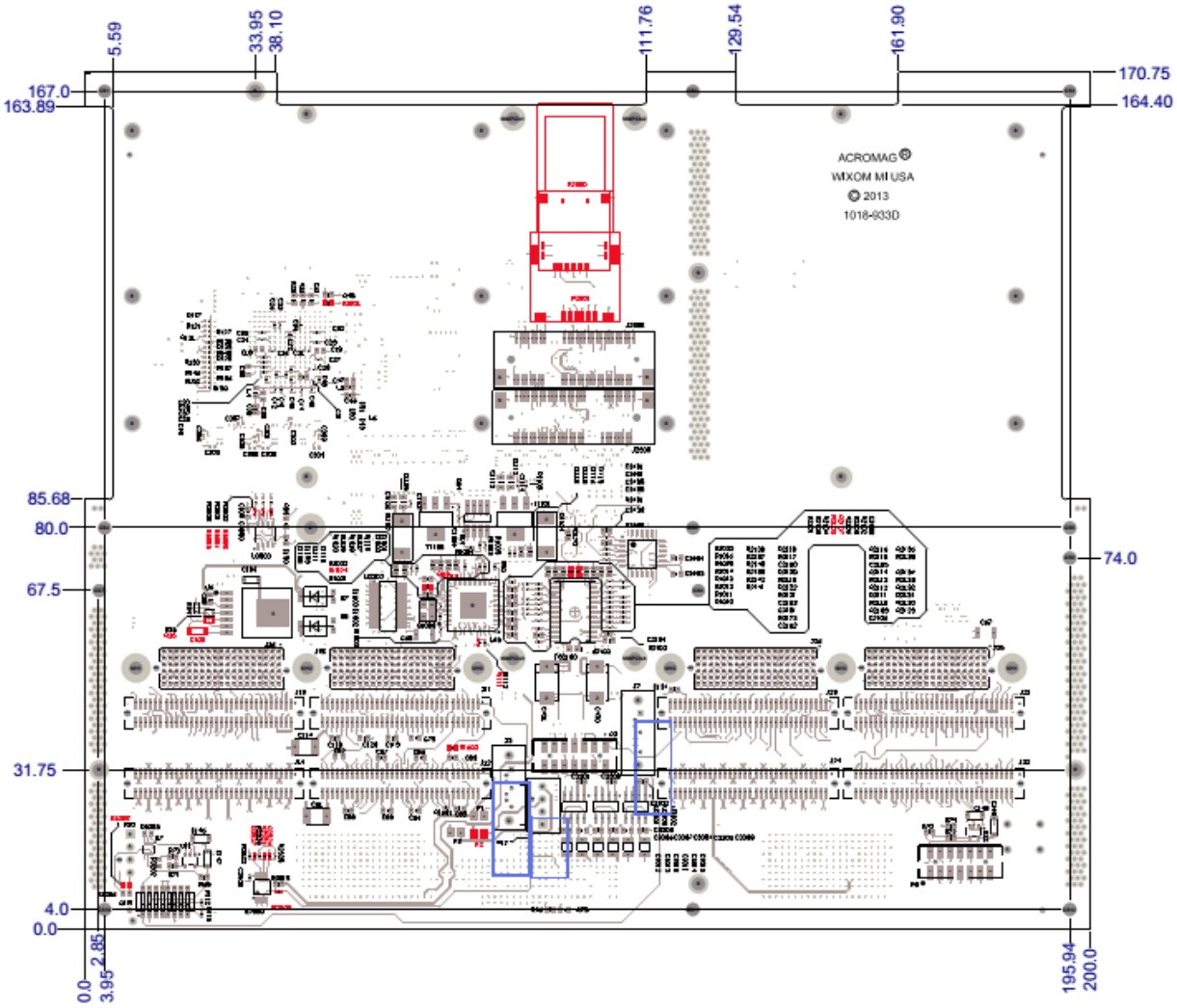
Height from Carrier PCB to tallest component 20.0mm (0.787 in)

- ACEX-4610 L x W: 170.73 mm x 125.0 mm (6.722 in x 4.921 in)
- ACEX-4620 L x W: 170.73 mm x 200.00 mm (6.722 in x 7.874 in)

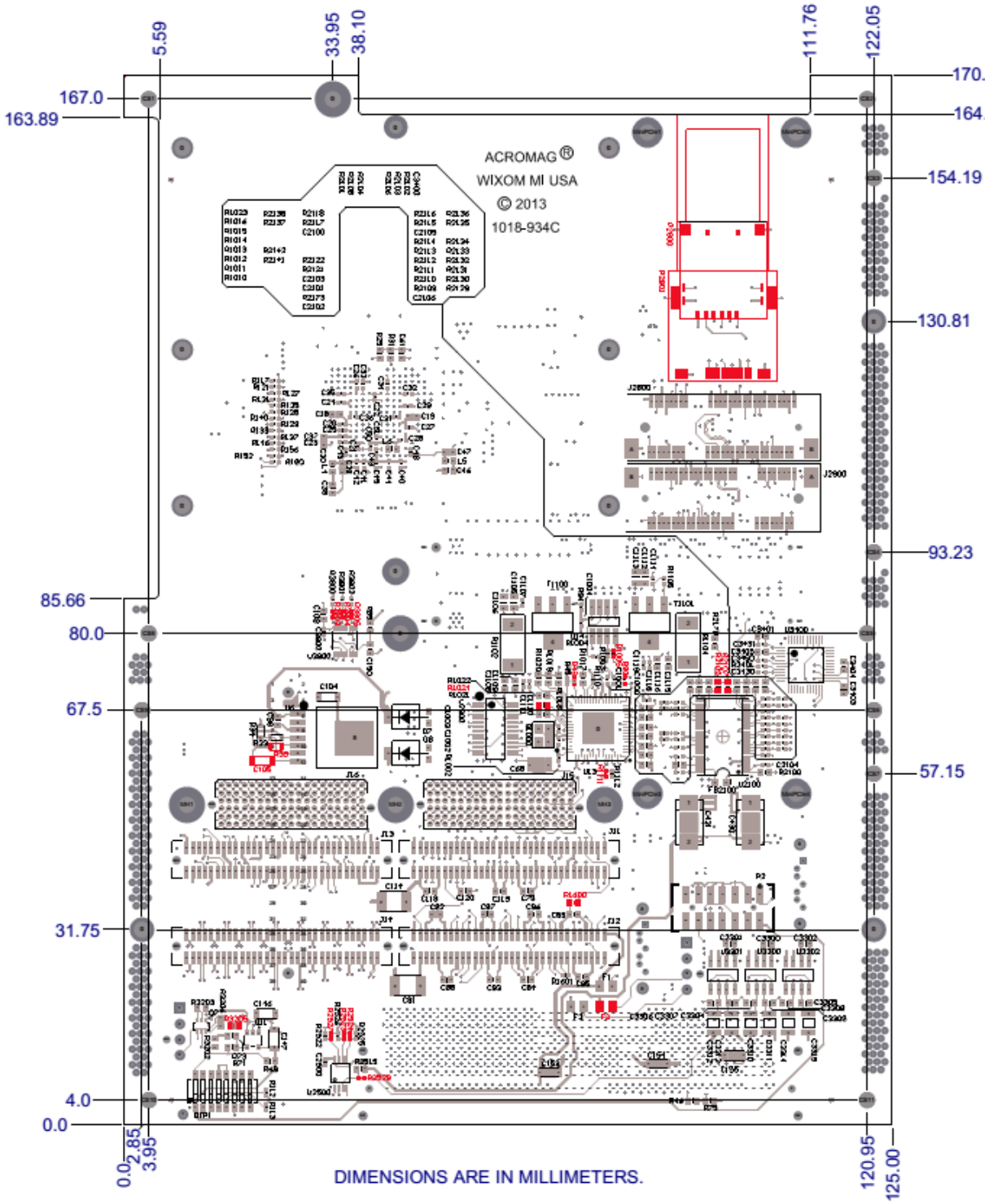
Unit Weight (does not include PMC/XMC modules or shipping material):

- ACEX-4610 0.68 lbs (0.309 kg)
- ACEX-4620 0.91 lbs (0.413 kg)





ACEX-4620 Carrier Dimensions in millimeters



ACEX-4610 Carrier Dimensions in millimeters

5.2 Power Requirements

Input power

- Operating Input Voltage Range: +10 to 36V DC.
- Required input watts: 175W
- Absolute maximum current: 17.5amps.

Summarized below are the expected current draws for each of the specified power supply output voltages.

Power Supply Voltage	Current Draw
• 3.3 VDC +/- 5%[1]	0.929 A Typical, 10 A maximum
• 5.0 VDC +/- 5%[1]	0.288 A Typical, 9 A maximum
• +12 VDC +/- 5%[1]	1.210 A Typical, 7 A maximum
• -12 VDC +/- 5%[1]	0 A Typical, 1 A maximum

Note 1: *Typical current draw is using an XCOM-6400-316 i5 @1.66GHz, an EDK with 64GB SSD, and without PMC/XMC modules installed; add additional current for PMC/XMC modules.*

5.3 Environmental Considerations

Summarized below are the operating temperature range, airflow and other environmental requirements and applicable standards for the ACEX-46XX family of carrier boards.

5.3.1 Operating Temperature

Model Number	***Description***	***Temp Range***
ACEX-4620-LF	*2 Slot PMC/XMC* ***Lead-free*** *Solder*	*-40°C to 85°C*[1-3]
ACEX-4610-LF-	*1 Slot PMC/XMC* ***Lead-free*** *Solder*	*-40°C to 85°C*[1-3]

Note 1: *An air cooled application with an Acromag XCOM-6400 will require purchase of the Active Heatsink* ***XHSA-6400****.*

Note 2: *Air cooled applications have a compromise temperature range of 0°C to 70°C.*

Note 3: *Audio Codec has a compromise temperature range of 0°C to 70°C.*

5.3.2 Other Environmental Requirements

5.3.2.1 Relative Humidity

The range of acceptable relative humidity is 5% to 95% non-condensing.

5.3.2.2 Isolation

The PCI/PCIe bus and field commons are non-isolated and have a direct electrical connection.

5.3.3 Vibration and Shock Standards

The ACEX-46XX carrier boards passed the following Vibration and Shock standards.

5.3.3.1 ACEX-4610/20

Vibration, Operating: MIL-STD-810G, Method 514.6
Procedure I (General Vibration)
Category 20 (Ground vehicles/ground mobile)
8-500Hz, Sinusoidal 5Grms X, Y and Z axis. 1hr per axis (15 minute sweep up / 15 minute sweep down test duration)
Shock, Operating: MIL-STD-810G, Method 516.6
Procedure I (functional Shock)
50g, 11ms half-sine 3 positive/negative per axis (Total of 18 drops)

5.3.4 EMC Directives

The ACEX-46XX carrier boards are designed to comply with EMC Directive 2004/108/EC.

- **Immunity per EN 61000-6-2:**
  Electrostatic Discharge Immunity (ESD), per IEC 61000-4-2.
  Radiated Field Immunity (RFI), per IEC 61000-4-3.
  Electrical Fast Transient Immunity (EFT), per IEC 61000-4-4.
  Surge Immunity, per IEC 61000-4-5.
  Conducted RF Immunity (CRFI), per IEC 61000-4-6.
- **Emissions per EN 61000-6-4:**
  Enclosure Port, per CISPR 16.
  Low Voltage AC Mains Port, per CISPR 16.
  Note: This is a Class A product

5.4 Reliability Prediction

Table 5.4.1 ACEX-4620

MTBF (Mean Time Between Failure): MTBF in hours using MIL-HDBK-217F, FN2. *Per MIL-HDBK-217, Ground Benign, Controlled,* $G_B G_C$

Temperature	MTBF (Hours)	MTBF (Years)	Failure Rate (FIT[1])
25°C	396,901	45.3	2,520
40°C	285,804	32.6	3,499

[1] FIT is Failures in 10^9 hours.

Table 5.4.2 ACEX-4610

Temperature	MTBF (Hours)	MTBF (Years)	Failure Rate (FIT[1])
25°C	420,431	48.0	2,379
40°C	305,064	34.8	3,278

[1] FIT is Failures in 10^9 hours.

5.5 PMC/XMC Specifications

- **x8 Gigabit lanes**: Available through SEARAY connector from the P16 connector driven by XMC cards
- **18 I/O pairs**: Available through SEARAY connector from the P16 connector driven by XMC cards
- **32 I/O pairs**: Available through SEARAY from the J4 connector driven by PMC or XMC cards

5.6 Other Specifications and Features

5.6.1 Gigabit Ethernet

- x2 Gigabit Ports
- COM Express module provide one Gigabit port direct to Searay
- Second Gigabit port converts x1 PCIe lane from COM Express to Gigabit port via Ethernet Controller.

5.6.2 SATA

- x2 SATA signaling
- Two SATA ports are routed direct from the COM Express to the Searay connector.
- Two additional SATA ports are routed from COM Express to the mini PCIe/mSATA sites.

5.6.3 PCIe

- x4 lane PCIe port routed direct from COM Express to Searay
- Gen2 (5.0Gbps)

5.6.4 mSATA/mPCIe

- x2 connector ports for mSATA or mPCIe cards

5.6.5 USB 2.0

- x2 USB2.0 signaling
    - These ports support USB 2.0 speed. These ports are backwards compatible to USB 1.1.

5.6.6 USB3.0

- x4 USB3.0 signaling
    - These ports support USB 3.0 speed. These ports are backwards compatible to USB 2.0 and USB 1.1.

5.6.7 Audio

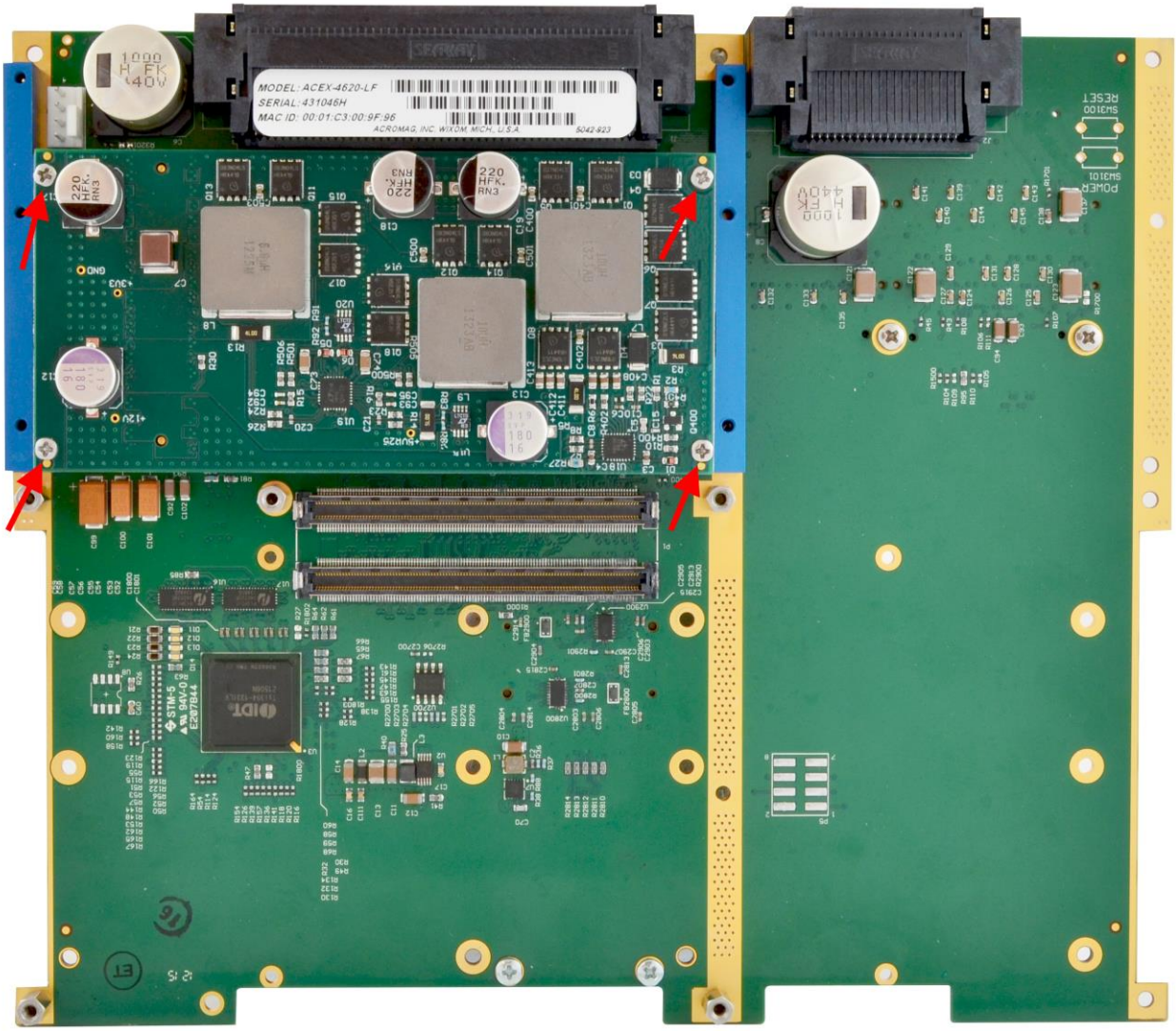
- High Definition Audio from COM Express to Audio Codec
- Audio line in port
- Audio line out port

5.6.8 GPIO

- x8 general purpose I/O
- 4 input ports
    - Input ports are 3.3V level signals routed direct from Com Express module. Absolute max input voltage is 3.6V.
- 4 output ports
    - Output ports are 3.3V level signals routed direct from the Com Express module.

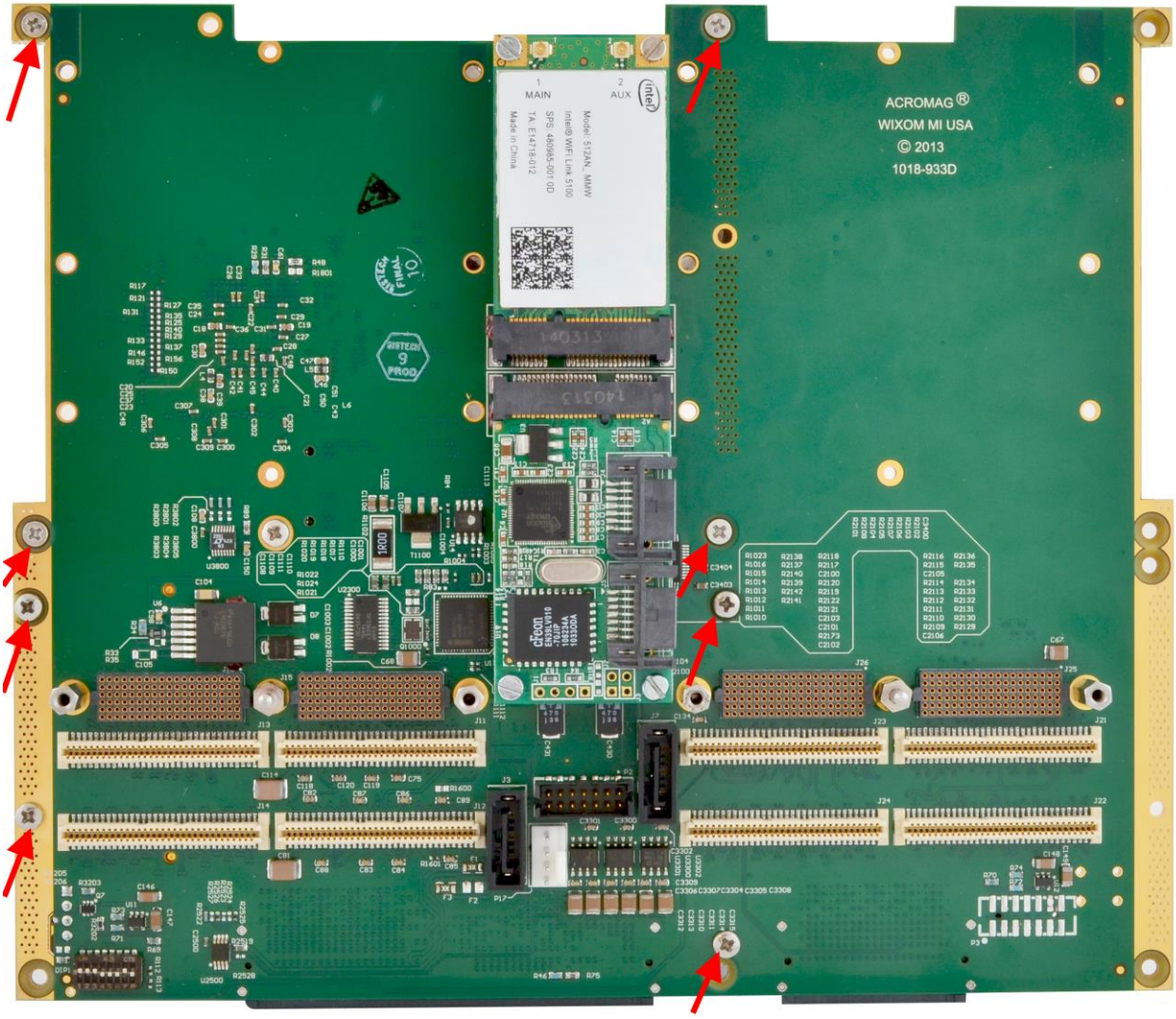
Appendix A

Installation of Conduction Cooling Kit ACEX-CC-01

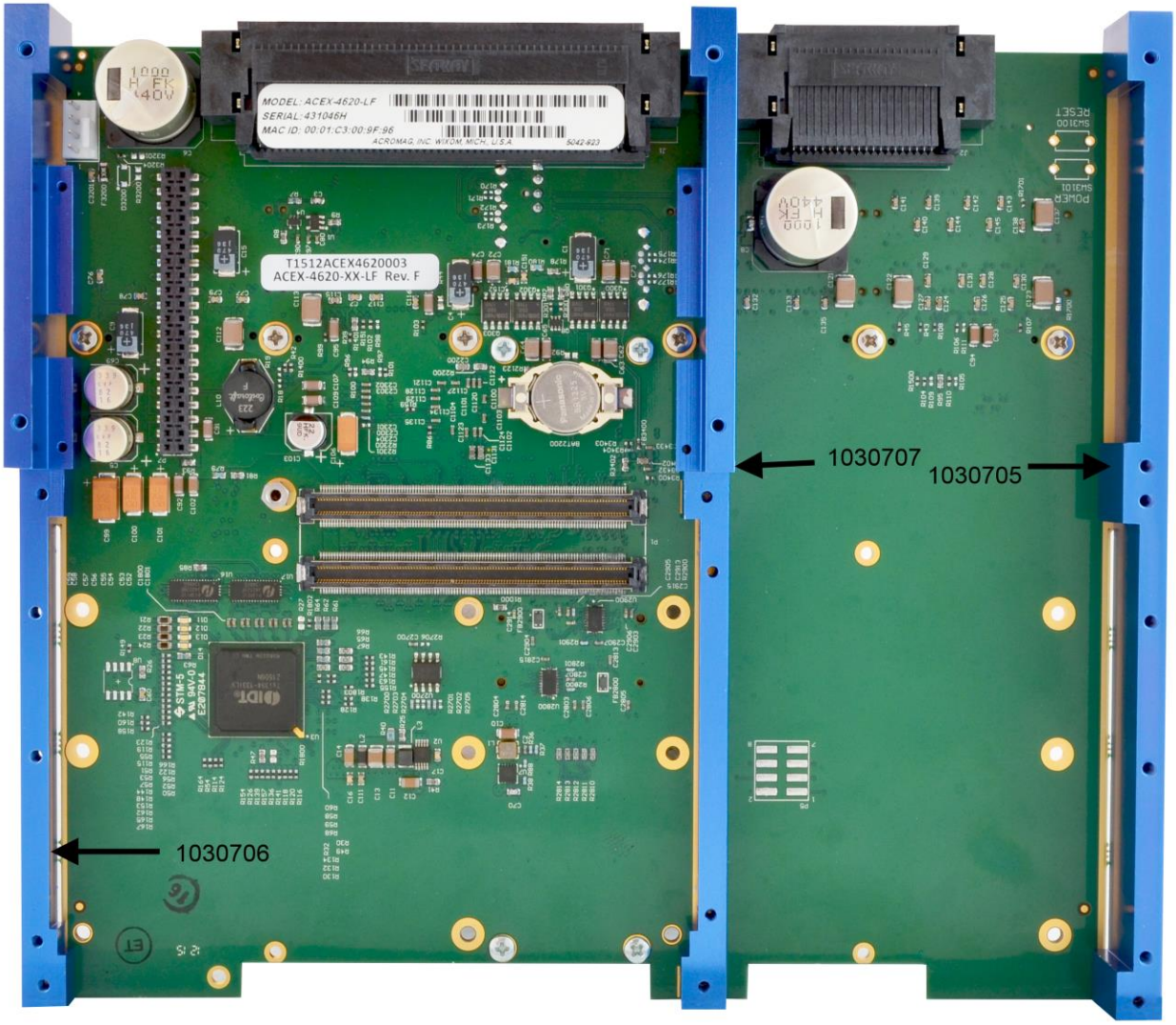


Remove 4 screws at the locations shown with the red arrows above. Put 4 screws aside for now. We will need them when we reinstall the power board as our last step.

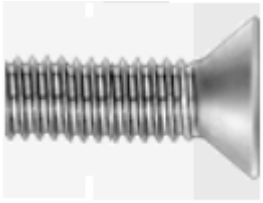
Carefully lift power board off the carrier. Do not use capacitors or inductors to hold onto as you free the power board from the carrier. Instead, use your fingers under the board in the area of the four corners to lift the power board off.



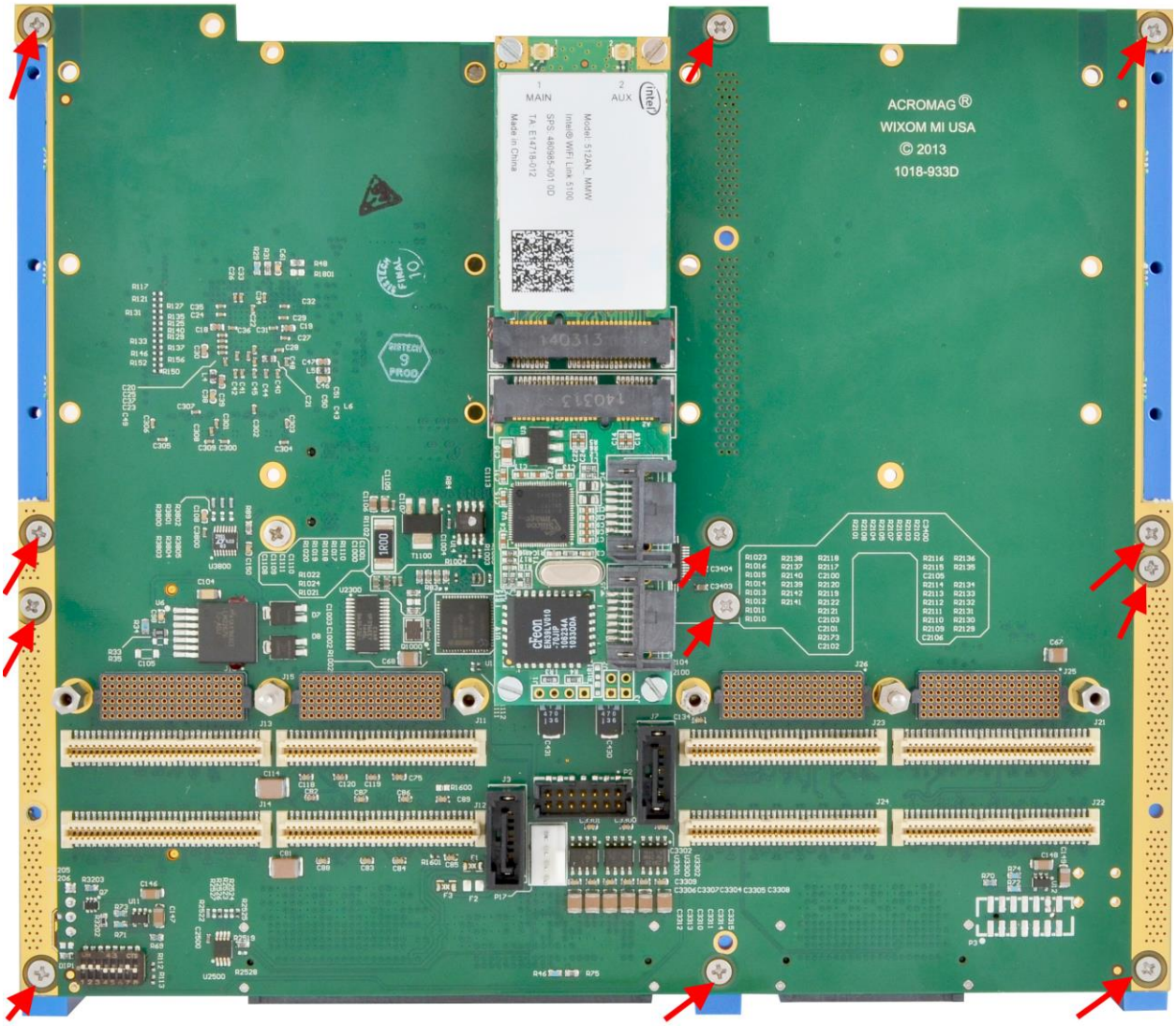
Remove 8 screws at the locations shown with the red arrows above. This will free 4 Com Express standoffs and two blue power board mounting rails. Note loctite was use with these screws so they may be difficult to remove.



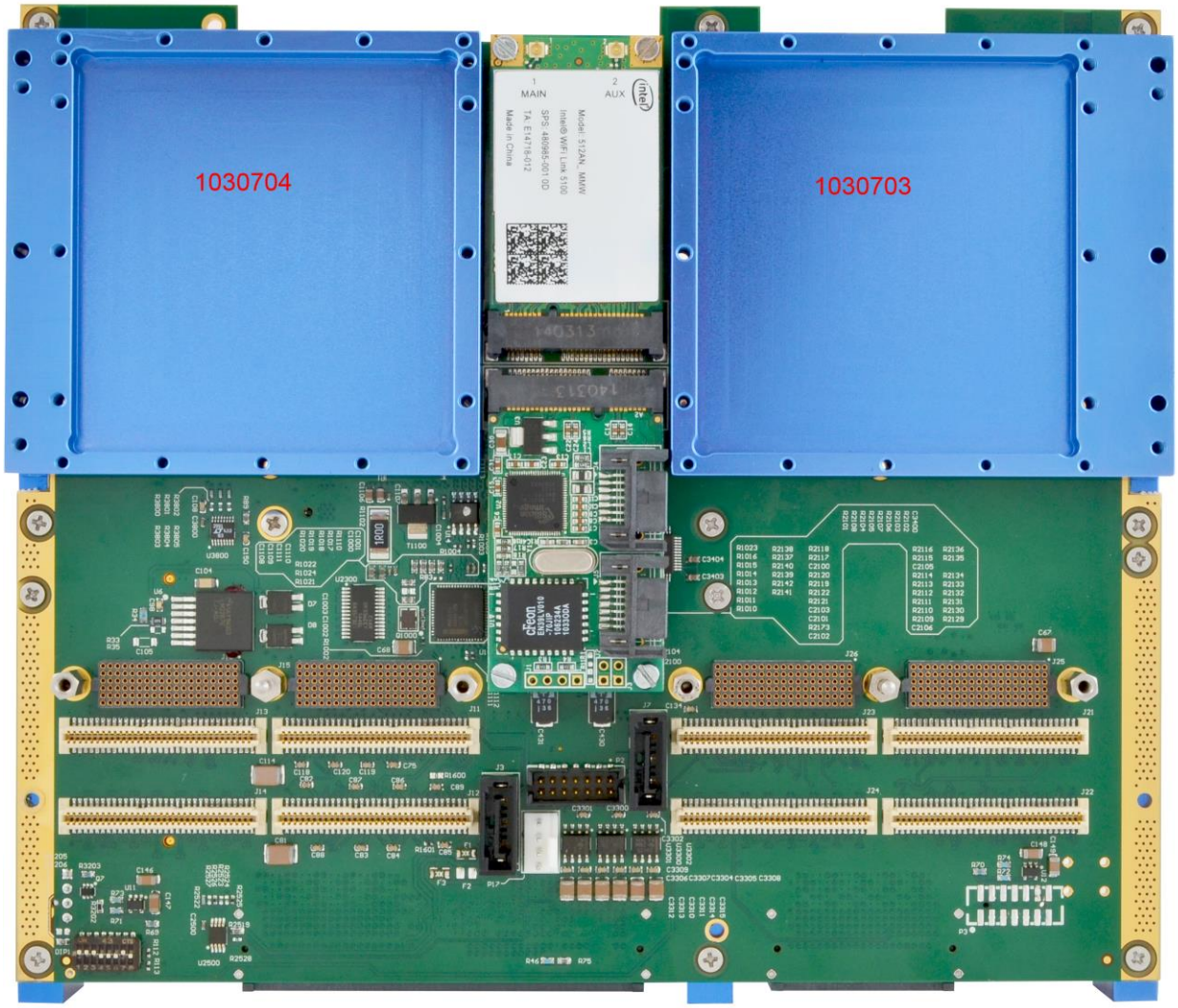
Install 1030706, center 1030707, and 1030705 conduction cooling rails in locations shown above. Use 12 of the countersunk screws provided. See countersunk screw image below.



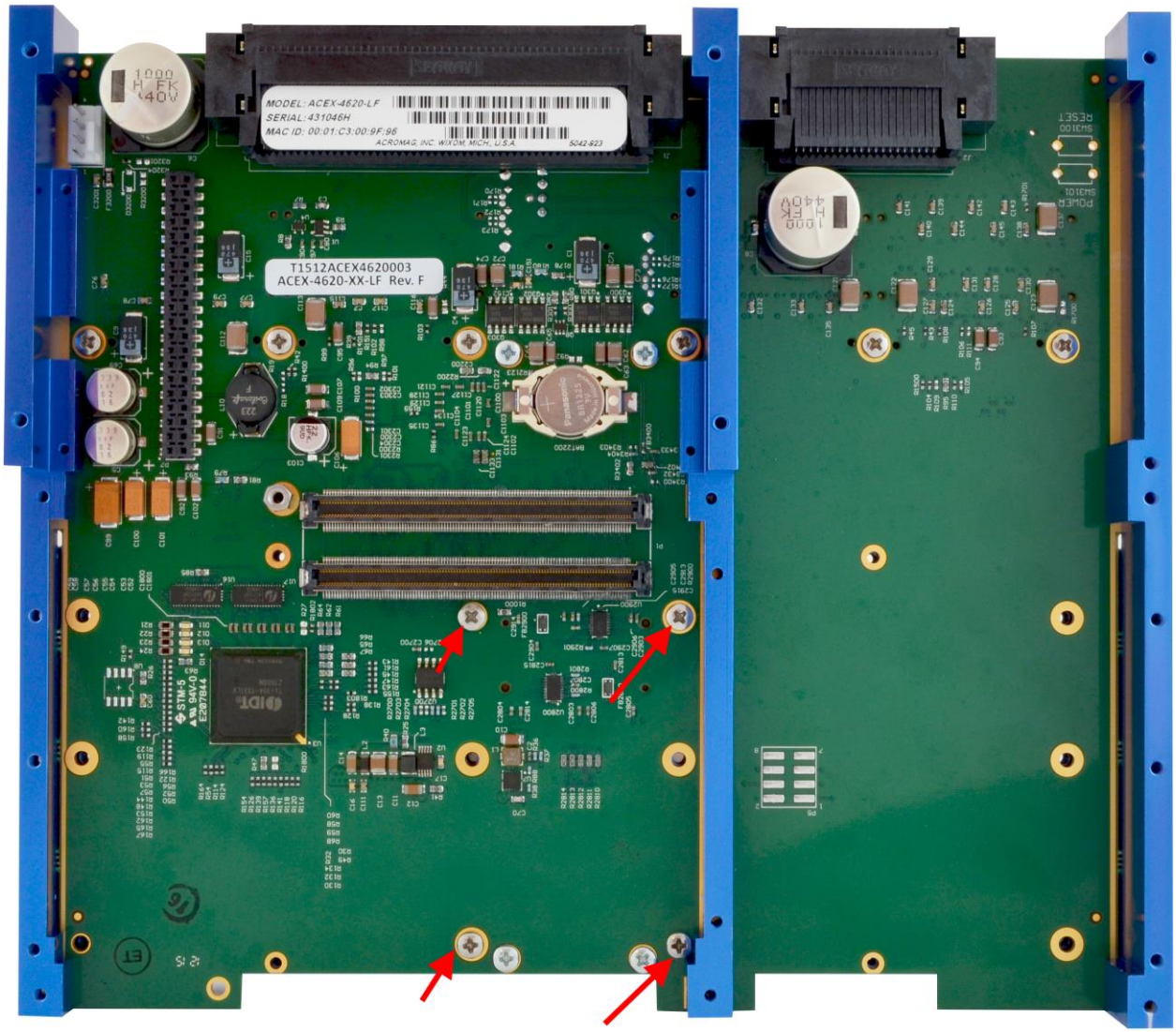
See the following image which shows the location of these 12 screws used to hold the 3 conduction cooling rails.



This image shows the location of these 12 screws used to hold the 3 conduction cooling rails.

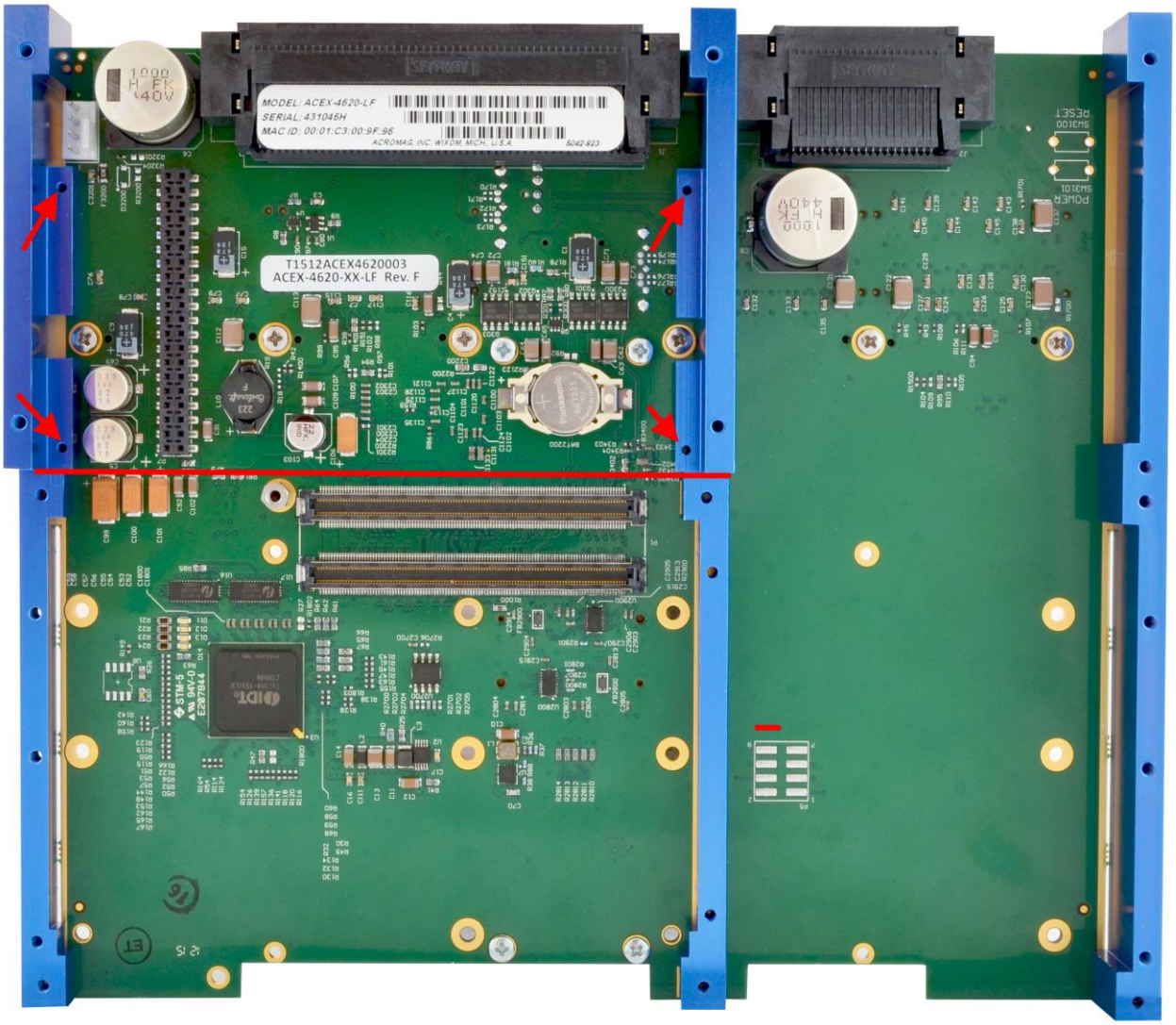


The XMC/PMC conduction cooling rails1030704 and 1030703 are located as shown in this image. Place the conduction cooling rails on the board as shown above.



To hold the XMC/PMC condoction cooling rails to the board the screws shown in the image above must be used.

The four (M2.5 x 6MM) screws are used in the locations shown in the above image.



Reinstallation of the power board is described here. Install the power board in the location as shown above. Note that the edge of the power board must align with the conduction cooling rails as shown with the red lines above. If offset from this alignment then the power board is not properly located on the board. Reinstall four screws that were set aside from removal of the power board in a previous step.

Certificate of Volatility

Acromag Model ACEX-4620/4610	Manufacturer: Acromag, Inc. 30765 Wixom Rd Wixom, MI 48393			
Volatile Memory				
Does this product contain Volatile memory (i.e. Memory of whose contents are lost when power is removed) □ Yes ■ No				
Type (SRAM, SDRAM, etc.)	Size:	User Modifiable □Yes □ No	Function:	Process to Sanitize:
Type (SRAM, SDRAM, etc.)	Size:	User Modifiable □ Yes □ No	Function:	Process to Sanitize:
Non-Volatile Memory				
Does this product contain Non-Volatile memory (i.e. Memory of whose contents is retained when power is removed) ■ Yes □ No				
Type(EEPROM, Flash, etc.) EEPROM	Size: 32Kb (4096 x 8)	User Modifiable ■ Yes □ No	Function: Storage of MAC ID and register setting for operation of Ethernet Controller	Process to Sanitize: Clear EEPROM memory by erasing all bytes.
Type(EEPROM, Flash, etc.) EEPROM	Size: 2Kb	User Modifiable ■ Yes □ No	Function: Storage of User Data	Process to Sanitize: Clear EEPROM memory by erasing all bytes.

Acromag Representative				
Name:	Title: Sales and Marketing	Email: solutions@acromag.com	Office Phone: 248-295-0310	Office Fax: 248-624-9234

Revision History

The revision history for this document is summarized in the table below.

Release Date (mm/dd/yyyy)	Version	EGR/DOC	Description of Revision
05/08/2014	Preliminary	LMP/LMP	Preliminary Document Publication
09/03/2014	A	LMP/LMP	Released Document Publication
10/03/2014	B	LMP/LMP	Added appendix A describing installation of conduction cooling kit ACEX-CC-01. Updated Vibration and Shock Test Results Added board conduction cooling and component height dimensions to section 5.1
11/07/2014	C	LMP/LMP	Added 500 pin Searay connector ground signals to Table 3.36.1. Added 200 pin Searay power and ground signal Table 3.36.2.
5/07/2015	D	LMP/LMP	Added reference to new carrier SATA connectors. Added power usage details. Removed reference to Lead –L models. Updated images to Rev D ACEX-4620 PCB
7/09/2015	E	LMP/LMP	Updated images to Rev C ACEX-4610 PCB